HART

REMEDIAL INVESTIGATION
AUTO ION INCORPORATED:
KALAMAZOO, MICHIGAN

Prepared By:

Fred C. Hart Associates, Inc.

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TABLE OF CONTENTS
(CONTINUED)

Section	Title	Page
	3.5.2 Methodology	3-68
	3.5.2.1 Well Elevation Survey	3-68
	3.5.2.2 Water Level Measurements	3-68
	3.5.2.3 Well Location and Topographic Survey	3-69
	3.5.2.4 Findings	3-69
	3.6 Permeability Testing	3-69
	3.6.1 Purpose	3-69
	3.6.2 Methodology	3-69
	3.6.3 Findings	3-77
	3.7 Surface Water and Sediment Sampling	3-79
	3.7.1 Purpose	3-79
	3.7.2 Methodology	3-79
	3.7.3 Findings	3-88
	3.7.3.1 Surface Water	3-88
	3.7.3.2 Sediments	3-89
	3.7.3.3 Other Discharges	3-108
	3.8 Subsurface Drum Investigation	3-109
	3.8.1 Purpose	3-109
	3.8.2 Methodology	3-109
	3.8.3 Findings	3-111
	3.9 Waste Water Disposal	3-111
4.0	GEOLOGY AND HYDROGEOLOGY	4-1
	4.1 Introduction	4-1
	4.2 Geology	4-1
	4.2.1 Regional Geology	4-1
	4.2.2 Site Geology	4-1
	4.3 Surface Water Hydrology	4-6
	4.4 Geohydrology	4-6
5.0	EXTENT OF CONTAMINATION	5-1
	5.1 Subsurface Soils	5-1
	5.2 Groundwater	5-9
	5.3 Surface Water	5-11
	5.4 Sediment	5-11
	5.5 Summary	5-13

LIST OF FIGURES

Number	Title	Page
2-A	Site Location Map	2-2
2-B	Site Map	2-5
3-A	Boring Locations	3-2
3-B	Monitoring Well Locations	3-37
3-C	Potentiometric Surface Map of Static Water Levels Measured 11-3-87	3-71
3-D	Potentiometric Surface Map of Static Water Levels Measured 1-8-88	3-72
3-E	Potentiometric Surface Map of Static Water Levels Measured 2-21-88	3-73
3-F	Potentiometric Surface Map of Static Water Levels Measured 3-7-88	3-74
3-G	Potentiometric Surface Map of Static Water Levels Measured 3-25-88	3-75
3-H	Sediment Sample Locations	3-80
3-I	Sediment and Surface Water Samples Locations, Transects A - D	3-81
3-J	Analyses above CRDL at Transects E & F.	3-102
3-K	Organic analyses above the CRDL at Transects A - D	3-103
3-L	Inorganic Analyses above the CRDL at Transects E & F	3-104
3-M	Inorganic Analyses above the CRDL at Transects A - D	3-105
3-N	Trench Excavation Location	3-110
4-A	Locations of Cross Sections	4-2
4-B	Geologic Cross Section W-1 to W-6	4-3
4-C	Geologic Cross Section W-3b to B-3	4-4

LIST OF FIGURES
(CONTINUED)

Number	Title	Page
4-D	Geologic Cross Section B-1 to W-5	4-5
5-A	Depths of Contaminants at Auto Ion B-1 and B-2 . .	5-2
5-B	Depths of Contaminants at Auto Ion B-3 through B-5	5-3
5-C	Depths of Contaminants at Auto Ion B-6 and B-7 . .	5-4
5-D	Depths of Contaminants at Auto Ion W1 and W2 . . .	5-5
5-E	Depths of Contaminants at Auto Ion W3b	5-6
5-F	Depths of Contaminants at Auto Ion W4 through W6 .	5-7

LIST OF TABLES

Number	Title	Page
2-1	Temperature & Precipitation Data	2-3
3-1	Soil Borings & Sample Depths	3-4
3-2	Hydraulic Conductivities	3-11
3-3	Organic Analyses Summary Sheet for Soil	3-12
3-4	Inorganic Analyses Summary Sheet for Soils	3-17
3-5	Pesticide/PCB Analyses Summary Sheet for Soil . . .	3-31
3-6	Typical Element Concentrations in Natural Soils . .	3-33
3-7	Laboratory Analyzed Groundwater Samples	3-40
3-8	Organic Analyses Summary Sheet for Groundwater . . .	3-41
3-9	Inorganic Analyses Summary Sheet for Groundwater . .	3-49
3-10	Comparison of Analytical Results for Two Rounds of Groundwater Samlping	3-51
3-11	Required Detection Limits (RDL)* Hazardous Substance List (HSL) Organic Parameters .	3-60
3-12	Well Data	3-70
3-13	Specific Values and Hydraulic Conductivities of Monitoring Wells	3-78
3-14	Surface Water Samples	3-82
3-15	Summary of Organic Concentrations above CRDL Surface Water Samples	3-83
3-16	Semivolatile Analyses Summary Sheet for Surface Water	3-84
3-17	Inorganic Analyses Summary Sheet for Surface Water .	3-85
3-18	Sediment Samples	3-86
3-19	Organic Analyses Summary Sheet for Sediments	3-90
3-20	Pesticide/PCB Analyses Summary Sheet for Sediments .	3-98
3-21	Inorganic Analyses Summary Sheet for Sediments . . .	3-99

LIST OF TABLES (CONTINUED)

Number	Title	Page
4-1	Comstock Gauge Data	4-7

LIST OF APPENDICES

APPENDIX I	Detailed Site Maps
APPENDIX II	Chronology of Significant Events
APPENDIX III	Boring & Well Logs
APPENDIX IV	Grain Size Distribution Analysis
APPENDIX V	Data Sheets, Case Narrative and QA/QC Review
APPENDIX VI	Monitoring Well Construction Diagrams and Slug Test Data
APPENDIX VII	NPDES Permits
APPENDIX VIII	Waste Water Disposal
APPENDIX IX	Fly Ash and Fly Ash Leachate Characteristics

1.0 INTRODUCTION

HART Environmental Management Corporation (HART) was retained by the Auto Ion Steering Committee of Potentially Responsible Parties (PRP's) to conduct a Remedial Investigation/Feasibility Study of the Auto Ion Site ("the Site") in Kalamazoo, Michigan. This investigation was implemented pursuant to CERCLA Administrative Order #VW-86-C-07 between the Auto Ion Steering Committee and the United States Environmental Protection Agency (EPA) under the national "Superfund" program. This report presents the results of the Remedial Investigation conducted at the Site from October 1987 through March 1988.

1.1 Purpose of Investigation

The purpose of the Remedial Investigation was to determine if any contaminants were present at the Site, determine any risk associated with those contaminants and gather data necessary to support a Feasibility Study for remediation.

The Auto Ion Site operated as a waste hauling, treatment and disposal facility from 1963 through 1973. Site investigations by the Michigan Department of Natural Resources (MDNR) and the EPA resulted in an Immediate Removal Action request. An immediate removal was conducted by the PRP's resulting in the removal of all surface material including the building. Subsequently, a work plan was developed to investigate the extent of environmental contamination at the Site and HART was retained to carry out the investigation.

The field investigation was designed to determine whether the past activities contaminated the soil, groundwater or the Kalamazoo River. The data generated from the investigation will enable HART to examine the risks, if any, to the public health and environment. The results of the investigation will be used in an evaluation of remedial alternatives for a Feasibility Study. The study can then provide a recommendation of the most appropriate remedial alternatives.

1.2 Scope of Work

The scope of the field effort to determine the presence and extent of contamination at the Site can be summarized as follows:

1.2.1 Subsurface Soil and Groundwater Investigation

This task assessed the subsurface conditions within and in the vicinity of the Site. The hydrogeologic assessment included a test boring and groundwater monitoring well installation program, permeability testing and a program of groundwater and soil sampling to characterize the groundwater and subsurface soil quality at the Site.

1.2.2 Surface Water/Sediment Investigation

This task assessed the status of the Kalamazoo River above, at and below the Site to determine what, if any, impact the Site has on the river. This investigation included a background search to identify other possible sources of contamination, and a surface water and river sediment sampling analysis program to characterize the river water and sediment quality.

1.2.3 Excavation for Alleged Buried Drums

This task, requested by the MDNR during the Site work, assessed the validity of allegations of buried drums put forth by informants. This portion of the investigation included the use of metal detection equipment and the opening of an observation trench to determine whether drums had been buried as alleged.

1.2.4 Field Surveying

This task resulted in the production of base maps of the Auto Ion Site. Data included in these maps consisted of the location of monitoring wells and test borings, elevation contours, and major Site features.

1.3 Contents of Report

This draft report has been divided into seven chapters. The first chapter contains introductory material pertaining to the purpose and scope of the investigation. The second summarizes background data collected prior to this investigation. A summary of the purpose, methodology and findings of all the field investigative activities is included in the third chapter. The fourth and fifth chapters summarize our current understanding of the geology, hydrology and extent of contamination at the Site. Chapter 6 contains the Endangerment Assessment (EA) and Chapter 7 contains the conclusions of the RI and EA report.

2.0 SITE BACKGROUND INFORMATION

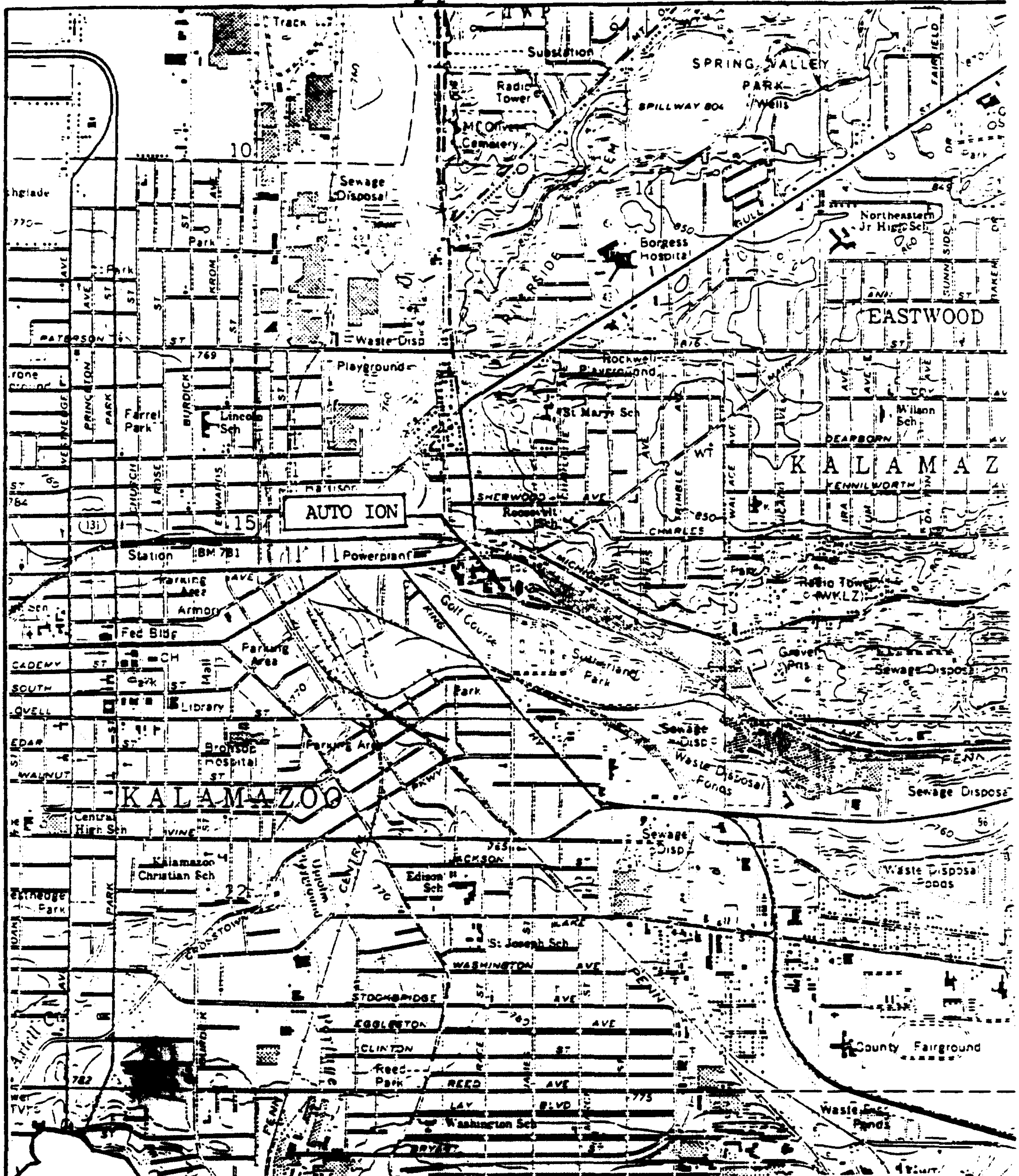
2.1 Physiographic Setting

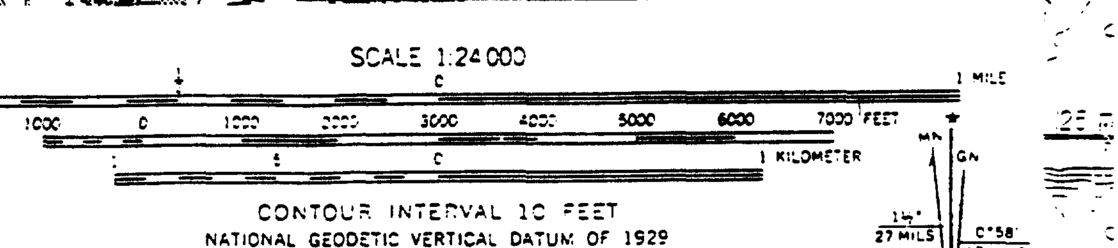
The Site is enclosed within an unmarked fenced lot at 74 Mills Street located in a northeast commercial industrial district in Kalamazoo, Michigan. Figure 2-A shows the Site location. The property is bordered on the south side by the Kalamazoo River and on the north side by O'Neil Street. South of the river is a small golf course. An auto impound lot is located 150 feet north of O'Neil Street. Adjacent to the Site on the west side is an industrial painting company and the Conrail round house property is located east of Mills Street.

The only residence in the immediate vicinity of the Auto Ion Site is located approximately 500 feet north of the Site on Mills Street, directly adjacent to the main railroad line from Detroit to Kalamazoo. Populations within a one mile and three mile radius of the Site are estimated by the Kalamazoo County Planning and Community Development Department to be approximately 36,000 and 100,000 respectively.

The City of Kalamazoo has a municipal well field located within one mile of the Site. However, this field has not been in use for approximately one year due to the contamination of the field by coliform. There are no plans to re-activate the field in the near future (from conversations with Bruce Minsley, Department Utilities Director, City of Kalamazoo, 1988). Little information is available on the usage of industrial wells in the vicinity of the Site. It is believed that all industries in the area are on the municipal supply, but several may continue to use their own wells for non-contact cooling water.

General climatological data for the Kalamazoo area is contained in Table 2-1. Kalamazoo receives an average of 34.4 inches of rainfall and 71.4 inches of snowfall per year. The average temperature varies from 24.8°F in January to 73°F in July.





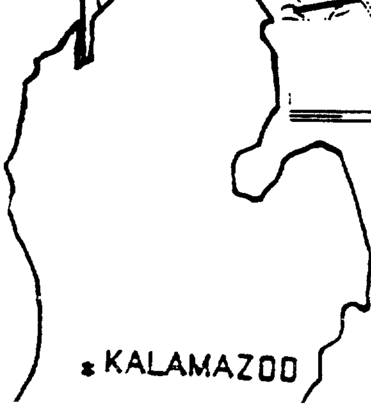


FIGURE 2-A

SITE LOCATION MAP

TABLE 2-1

TEMPERATURE AND PRECIPITATION DATA
AT KALAMAZOO, MICHIGAN

	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum Temperature higher than--	2 years in 10 will have-- Maximum Temperature lower than--	Average Number of growing degree days	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average Snowfall
	F	F	F	F	F	Units	In	In	In		In
January--	32.2	17.4	24.8	56	-9	0	2.10	1.20	2.90	6	17.8
February-	35.3	19.0	27.1	57	-6	0	1.83	.95	2.61	5	14.3
March----	44.9	26.3	35.6	74	05	15	2.48	1.59	3.29	7	11.0
April----	60.1	37.5	48.8	82	18	111	3.77	2.41	5.00	8	2.9
May------	71.8	47.4	59.6	89	29	324	3.36	2.09	4.51	7	T
June-----	81.3	57.5	69.4	95	40	589	3.49	2.10	4.73	7	0
July-----	84.8	61.2	73.0	96	47	721	3.56	2.14	4.83	6	0
August---	83.8	59.8	71.8	96	43	684	2.80	1.29	4.10	5	0
September	76.1	52.7	64.4	93	33	443	3.06	1.65	4.30	6	T
October--	65.2	43.1	54.2	85	24	195	2.74	1.19	4.06	5	.9
November-	47.8	32.4	40.1	72	8	27	2.67	1.77	3.50	7	9.3
December-	35.9	22.3	29.1	61	-1	0	2.53	1.30	3.60	7	15.2
Year---	59.9	39.7	49.8	98	-10	3,009	34.40	29.71	38.92	76	71.4

1 Recorded in the period 1947-76 at Kalamazoo, Michigan.

2 growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50°F).

2.2 Site Description

2.2.1 Physical Description. The original buildings, lagoons and waste debris, once present on the Site, were removed in 1986 leaving a fairly flat, fenced, vacant lot. A concrete pad is still present in the northern section of the Site. Figure 2-B is a general Site map showing the Site as it can be found today. Detailed Site maps can be found in Appendix I.

2.2.2 History. The original building that occupied the Auto Ion Site is believed to have been constructed during the 1940's. It served as a city operated coal-fired power plant for Kalamazoo's street lights. In 1956 Consumers Power Company purchased the plant from the City of Kalamazoo. Shortly after purchasing the facility, Consumers Power Company closed it and began the dismantling and removal of salvageable materials and equipment. The property was then sold on land contract to Auto Ion Chemical Company in 1963.

Auto Ion Chemical Company commenced operations in 1964 as a plating waste treatment facility. The plant was originally designed to precipitate the heavy metals from chrome and cyanide waste. The resulting sludge was then to be disposed of at a suitable dump Site and the supernatant, created in the cyanide waste treatment, was to be discharged into the sanitary sewer system. However, inadequate waste treatment and storage may have led to a multitude of spills and illegal discharges into the Kalamazoo River, and storm and sanitary sewer systems.

During the plants operation, several violations were reported by government officials. These officials reported unapproved discharges into sanitary lines and into the Kalamazoo River directly. Also inspection by officials noted a lack of diking around storage tanks and the presence of unlabeled leaking drums (CH_2M HILL, 1984 and MDNR files).

The Water Resource Hearing Commissions made the determination that Auto Ion had violated provisions of the Liquid Industrial Waste Act (Act 136, Public Acts 1969) and the Water Resources Act (Act 245, Public Acts 1929) (Development Planning & Research Associate, Inc., 1983). In

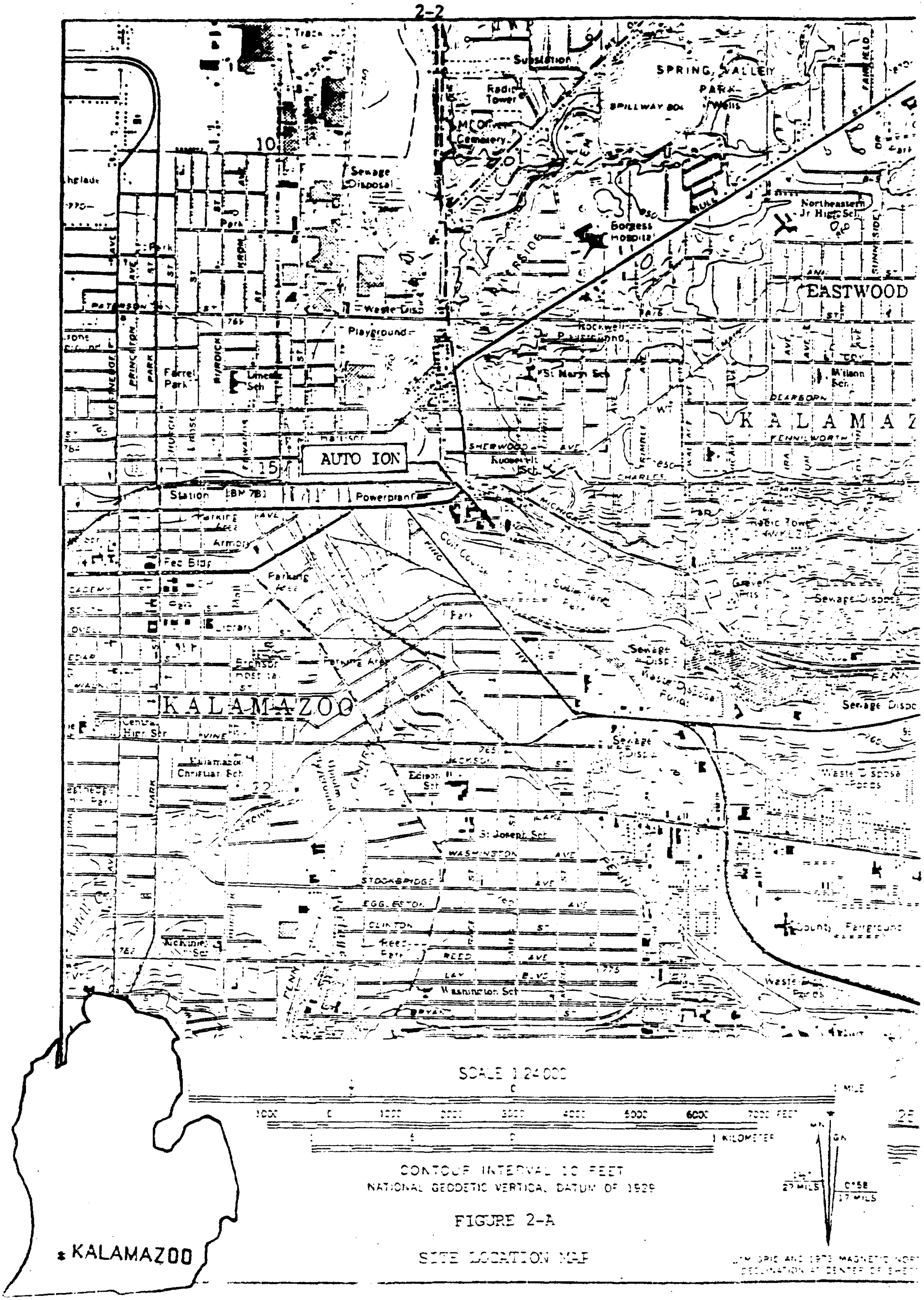


FIGURE 2-A

SITE LOCATION MAP

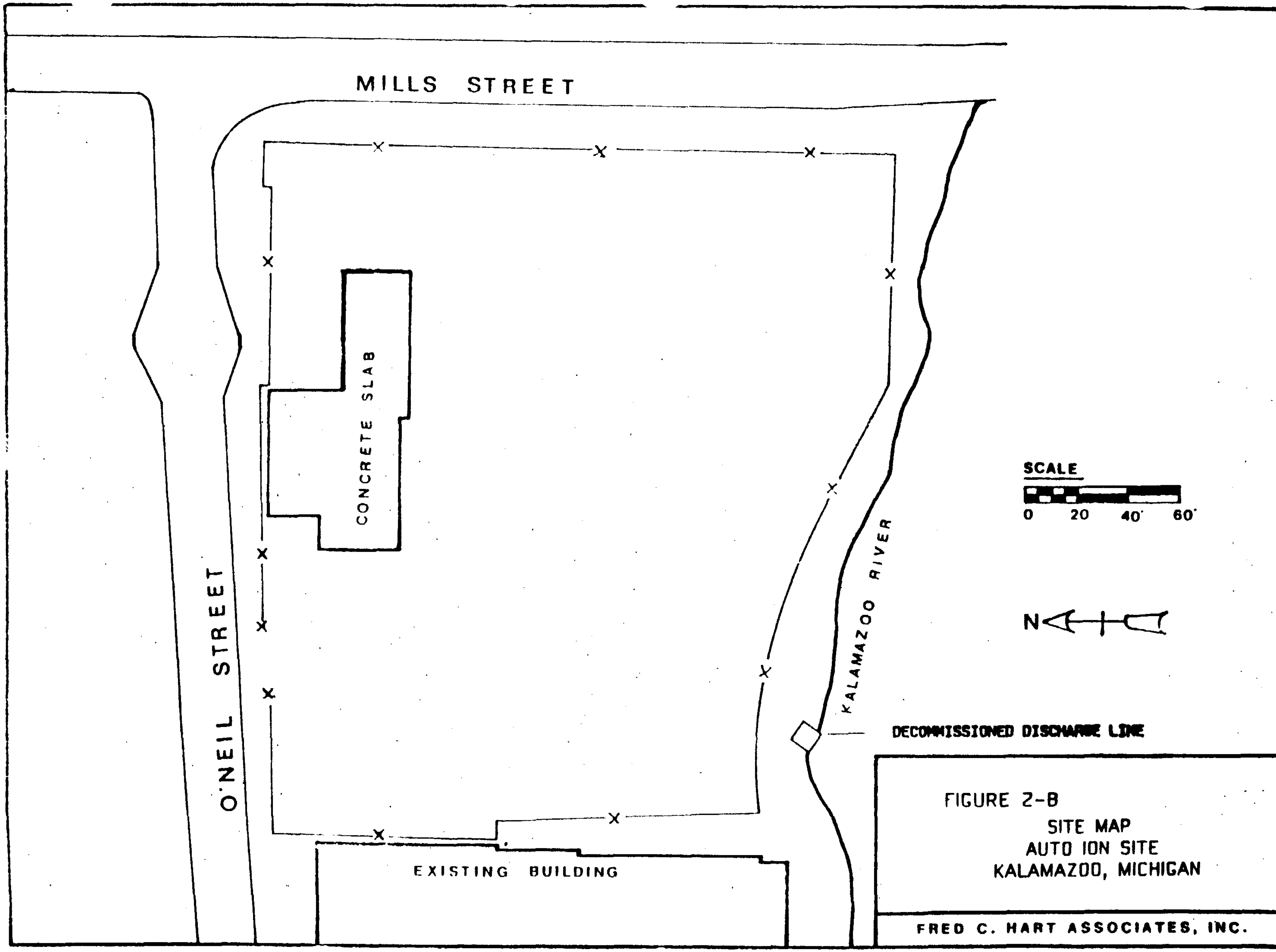


FIGURE 2-8
SITE MAP
AUTO ION SITE
KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

addition, it is believed that organic fertilizer waste may have been left on the Site by an organic fertilizer company which operated out of one the buildings on the Site during the late 1960's. Auto Ion's license to haul liquid wastes and certification as a waste treatment facility were not renewed in 1973.

When Auto Ion ceased operation, the main building was abandoned with uncontained waste in the basement. There were also several storage tanks, a block house on the river, a concrete lagoon containing liquid waste and an assortment of drums left on the Site.

In 1976 James Rooney, the owner of Auto Ion Chemical Company submitted an article of incorporation for the Tropical Essence Company, located at the Site in question. Finally, in 1981 the property reverted to state ownership for failure to pay property taxes.

In 1982 fencing was installed around the Auto Ion property and plans for demolition were begun. Chemical samples were also taken in 1982.

In 1983, an Emergency Action Plan was completed by Technical Assistance Team (TAT). In accordance with the Emergency Action Plan a surface removal of contaminants on Site was conducted by OH-Materials, Inc. on behalf of the Auto Ion Steering Committee. This was followed by the demolition of the buildings, under the direction of the City of Kalamazoo in 1986.

A chronology of significant events related to the Auto Ion Site can be found in Appendix II.

3.0 SUMMARY OF FIELD INVESTIGATION ACTIVITIES

3.1 Introduction

HART's field activities at the Auto Ion Site were conducted from October 1987 through March 1988. Field activities were designed to determine if contaminants were present in subsurface soils, surface water and sediments, as well as to obtain detailed information on geologic and hydrogeologic conditions present within the Site. The greater part of the field work consisted of drilling soil borings and installing monitoring wells. In addition, a comprehensive sampling effort was instituted that consisted of sampling soil, groundwater, surface water and river sediments. During the field work, a request by the MDNR to determine the validity of allegations concerning buried drums was acknowledged and accomplished by the field team.

This chapter contains a discussion of the purpose, procedures and results of each field activity and presents the data generated by these activities.

3.2 Test Boring Operations

3.2.1 Purpose. A total of 14 test borings were drilled, 13 on-Site and 1 off-Site, by Fox Drilling Company of Itasca, Illinois. Test borings were drilled to identify the presence of contaminants and to determine the subsurface geology. Of the fourteen borings, seven were converted to monitoring wells (Figure 3-A).

3.2.2 Methodology. All test borings were drilled within unconsolidated deposits overlying the bedrock. These borings were drilled with a CME 75 using 3 3/4" x 7 3/4" hollow stem augers and 4" roller bit mud rotary depending on the depth of the boring (boring logs are located in Appendix III). The borings were advanced to the desired depth below the water table or until bedrock was encountered.

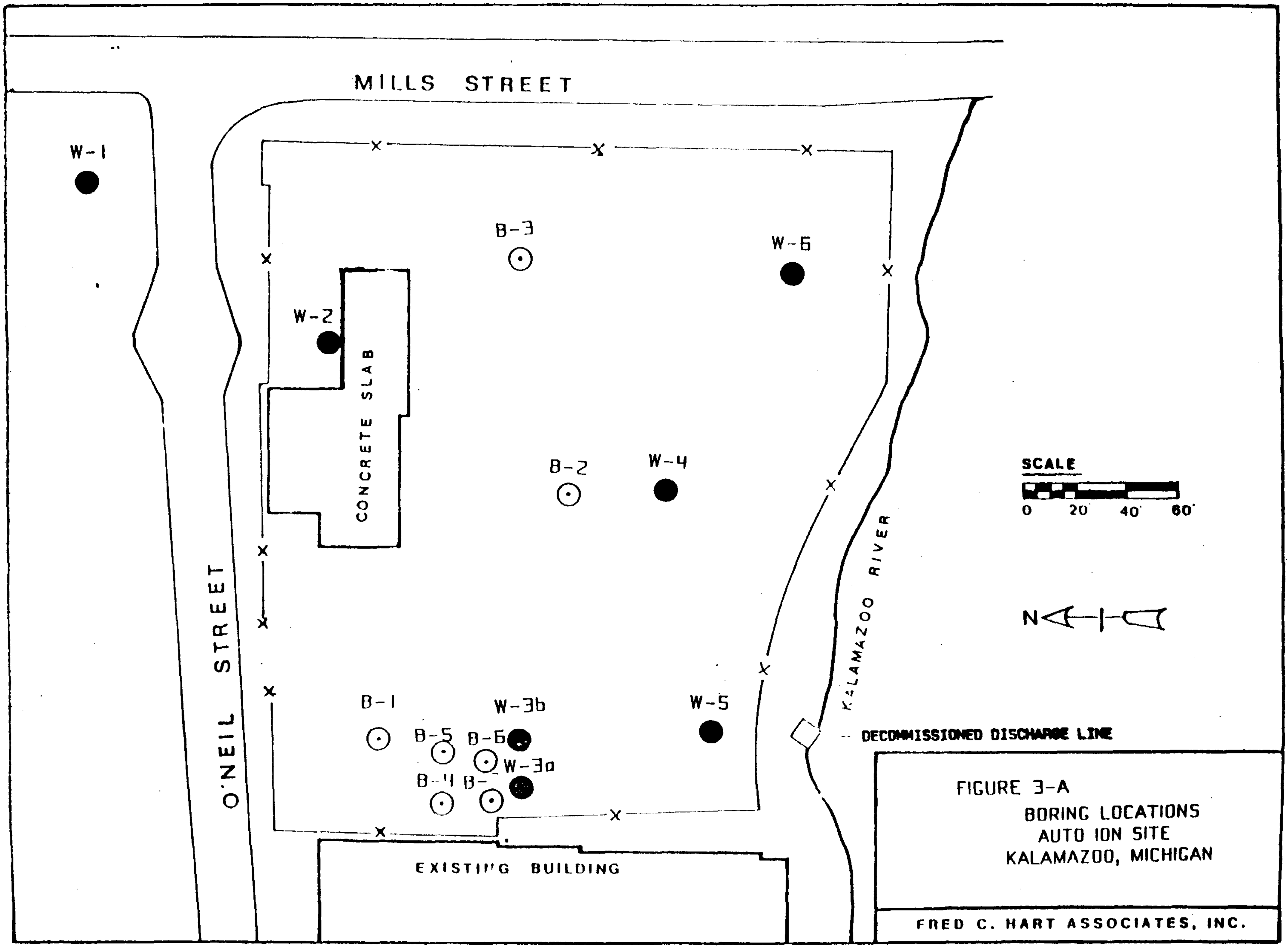


FIGURE 3-A
BORING LOCATIONS
AUTO ION SITE
KALAMAZOO, MICHIGAN

All drilling equipment used (i.e., drill bits, augers, rods, rig) was decontaminated between test borings to minimize the possibility of cross-contamination. The decontamination process consisted of the removal of bulk solids from all apparatus with a hot water, high pressure wash.

All drill cuttings off Site were brought within the fenced area of the Site. The decontamination and development water was collected and stored until disposal. Drilling mud was also collected and stored on Site for future disposal.

3.2.2.1 Soil Sample Collection and Analysis. Lithologic samples were collected at selected intervals (Table 3-1) in advance of the boring. Samples were collected with a two-inch diameter, two foot long split spoon sampler driven over a two foot interval with a 140 pound hammer falling 30 inches. The split spoon samplers used at each boring were decontaminated prior to sampling and between sampling using the following procedures:

* Scrubbed clean in soapy water with a scrub brush.
* Tap water rinse
* Distilled deionized water rinse
* Methanol rinse
* Distilled deionized water rinse

All sampling equipment (spoons, knives, bowls, etc.) were precleaned prior to sampling and between samples as described above. All samples were collected and described in detail by a HART field geologist during boring operations. Descriptions included:

a. soil characteristics (type, thickness, color, etc.)
b. description of any visual contamination
c. approximate water content

Samples were obtained from each split spoon with a clean knife and placed in the appropriate jars for analysis of metals, cyanide, volatile organics, acid base neutrals, pesticides and PCB's. The remainder of each sample was then placed in an 8 ounce jar for storage.

TABLE 3-1

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analyses		
W1	7.5'	0-2	S-W1-1	Organics,	Inorganics,	Pesticide/PCB
		2-4	S-W1-2	"	"	"
		4-6	S-W1-3	"	"	"
		9-11	S-W1-4	"	"	"
		14-16	S-W1-5	"	"	"
		19-21	S-W1-6	"	"	"
W2		0-2	S-W2-1A		Inorganics	
		0-2	S-W2-1B		"	
		2-4	S-W2-2		"	
		4-6	S-W2-3		"	
		9-11	S-W2-4		"	
		17-19	S-W2-5		"	
W3B		0-2	S-W3B-1	Organics,	Inorganics,	Pesticide/PCB
		2-4	S-W3B-2	"	"	"
		4-6	S-W3B-3A	"	"	"
		4-6	S-W3B-3B	"	"	"
		6-8	S-W3B-4	"	"	"
		13.5-15.5	S-W3B-5	"	"	"
		17-19	S-W3B-6	"	"	"
		24-25.5	S-W3B-7	"	"	"
		29-30.5	S-W3B-8	"	"	"
		34-35.5	S-W3B-9	"	"	"
		39-40.5	S-W3B-10	"	"	"
		44-45.5	S-W3B-11	"	"	"

TABLE 3-1 (CONTINUED)

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analysis
W3B (continued)		S-W3B-11		" " "
		49-50.5	S-W3B-12	" " "
W4		0-2	S-W4-1	Inorganics
		2-4	S-W4-2	"
	DO NOT USE	4-6	S-W4-3	"
		9-11	S-W4-4	"
		12-14	S-W4-5	"
		19-21	S-W4-6	"
		22-24	S-W4-7	"
W5		0-2	S-W5-1	Inorganics
		2-4	S-W5-2	"
		4-6		"
		6-8	S-W5-4a	"
		6-8	S-W5-4b	"
		8-10	S-W5-5	"
		14-16	S-W5-6	"
		24-26	S-W5-7	"

TABLE 3-1 (CONTINUED)

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analyses
W3B (continued)		49-50.5	S-W3B-12	" " "
W4		0-2	S-W4-1	Inorganics
		2-4	S-W4-2	"
		4-6	S-W4-3	"
		9-11	S-W4-4A S-W4-4B	" "
		12-14	S-W4-5	"
		19-21	S-W4-6	"
W5		0-2	S-W5-1	Inorganics
		2-4	S-W5-2	"
		6-8	S-W5-4A	"
		6-8	S-W5-4B	"
		8-10	S-W5-5	"
		14-16	S-W5-6	"
		24-26	S-W5-7	"
W6		0-2	S-W6-1	Inorganics
		2-4	S-W6-2	"
		4-6	S-W6-3	"
		6-8	S-W6-4	"
		9-11	S-W6-5	"
		12-14	S-W6-6a	"
		12-14	S-W6-6b	"

TABLE 3-1 (CONTINUED)

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analysis	
W6 (continued)		14-16	S-W6-7		"
		19-21	S-W6-8		"
B1		0-2	S-B1-1		Inorganics
		2-4	S-B1-2A S-B1-2B		" "
		4-6	S-B1-3		"
		8-10	S-B1-4	Organic,	Inorganics
		13.5-15	S-B1-5	"	"
		18.5-20	S-B1-6	"	"
		23.5-25	S-B1-7	"	"
		25-26.5	S-B1-8	"	"
		28.5-30	S-B1-9	"	"
		33.5-35	S-B1-10	"	"
		38.5-40	S-B1-11	"	"
		43.5-45	S-B1-12	"	"
		48.5-50	S-B1-13	"	"
		58.5-60	S-B1-14	"	"
		68.5-70	S-B1-15	"	"
		78.5-80	S-B1-16	"	"
		88.5-90	S-B1-17	"	"
		103.5-105	S-B1-19	"	"

TABLE 3-1 (CONTINUED)

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analyses		
B2		0-2	S-B2-1	Organics, Inorganics, Pesticide/PCB		
		9-11	S-B2-3	"	"	"
		14-16	S-B2-5	"	"	"
		18.5-20	S-B2-6	"	"	"
		23.5-25	S-B2-7	"	"	"
		28.5-30	S-B2-8	"	"	"
B3		0-2	S-B3-1	Organics, Inorganics		
		2-4	S-B3-2	"	"	
		4-6	S-B3-3a	"	"	
		4-6	S-B3-3b	"	"	
		8-10	S-B3-4	"	"	
		10-12	S-B3-5	"	"	
		13.5-15	S-B3-6	"	"	
		18.5-20	S-B3-7	"	"	
		23.5-25	S-B3-8	"	"	
		28.5-30	S-B3-9	"	"	
		33.5-35	S-B3-10	"	"	

TABLE 3-1 (CONTINUED)

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analyses
B3 (continued)		38.5-40	S-B3-11	Organics, Inorganics
		43.5-45	S-B3-12	" "
		48.5-50	S-B3-13	" "
		58.5-60	S-B3-14	" "
		68.5-70	S-B3-15	" "
		78.5-80	S-B3-16	" "
		88.5-90	S-B3-17	" "
B4		0-2	S-B4-1	Inorganics
		2-4	S-B4-2	"
		4-6	S-B4-3	"
		6-8	S-B4-4A S-B4-4B	"
B5		0-2	S-B5-1	Inorganics
		2-4	S-B5-2	"
		4-6	S-B5-3	"
		6-8	S-B5-4	"
B6		0-2	S-B6-1	Inorganics
		2-4	S-B6-2	"
		4-6	S-B6-3	"

TABLE 3-1 (CONTINUED)

AUTO ION SOIL BORINGS, SAMPLE DEPTHS
OCTOBER, 1987

Boring Number	Depth to Water	Depth of Sample (ft)	Sample Number	Analyses
B7		0-2	S-B7-1	Inorganics
		2-4	S-B7-2A	"
			S-B7-2B	"
		4-6	S-B7-3	"
		6-8	S-B7-4	"

As per the work plan the soil sampling program required inorganic and organic parameters be analyzed for samples from W-1, W-3b and B-2. Samples from the remaining were analyzed for inorganics only. The boring W-3a was not sampled as it is located next to W-3b which was sampled.

3.2.3 Findings

3.2.3.1 Subsurface Characteristics. Test boring logs prepared by HART are in Appendix III. The data obtained from the test borings was used to construct cross-sections and prepare the description of Site geology provided in Section 4.2.2. Sieve analyses were run for 15 soil samples at 6 boring locations on the Auto Ion Site. The grain size distributions for these samples can be found in Appendix IV. The grain size distributions, with the exception of those for well W3-B, show well graded and gap graded sediments. The sediments range from sandy gravel at B-1, W-2 and B-3 to sediments with 90% passing the #200 sieve at B-2 and W-5. The grain size distributions indicate that the sediments present are glacial or fluvial glacial in origin.

Sieve analyses in W-3b shows very uniform sands with a D_{10} of 0.1 mm and a uniformity coefficient $Cu = D_{60}/D_{10}$ of 2. This uniform sand would allow for permeabilities of up to 10^{-2} cm/s (Freeze & Cherry 1979) greatly increasing the potential chances of contaminant transport away from this area.

Atterberg limits and permeability tests were not conducted for these samples. The values shown in Table 3-2 are representative, however, of the permeabilities that can be expected for the samples taken.

3.2.3.2 Analytical Results. The soil samples collected in the borings were sent to Century Laboratories, Inc. for inorganic analyses and United States Testing Company, Inc. for organic analyses. Tables 3-3 through 3-5 contain a summary of the analytical data. The laboratory data sheets, case narratives, and a QA/QC review of the soil sample data are contained in Appendix V.

TABLE 3-2

HYDRAULIC CONDUCTIVITIES

	Kcm/sec
Glacial Till	10^{-7}
Silty Sand	10^{-3}
Clean Sand	10^{-2}
Gravel	1-10

Table 3-3
AUTO ION SITE
ORGANIC ANALYSIS SUMMARY SHEET FOR SOIL
ALL USEABLE DATA ABOVE RDL (UG/KG)

DEPTH	9 - 11'	19 -21'	2 - 4'	4 - 6'	6 - 8'	13.5-15.5'	44-45.5
COMPOUND	S-W1-4	S-W1-6	S-W3B-2	S-W3B-3B	S-W3B-4	S-W3B-5	S-W3B-1
Chloromethane	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Methylene Chloride	U	U	18	24	5	32	U
Acetone	R	R	110	U	39	U	14
Carbon Disulfide	U	U	U	60	25	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Trans-1,2-Dichloroethene	U	U	U	U	7	U	U
Chloroform	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
2-Butanone	U	58	85	300	37	U	U
1,1,1-Trichloroethane	U	U	6	U	8	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	35	96	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
2-Chloroethylvinylether	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	12	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Toluene	U	U	65	12	14	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylbenzene	U	U	6	U	U	U	U
Styrene	U	U	U	U	U	U	U
Total Xylenes	U	U	U	U	U	U	U

U= Below CRDL R= Unuseable data

Table 3-3 (cont.)
AUTO ION SITE
ORGANIC ANALYSIS SUMMARY SHEET FOR SOIL
ALL USEABLE DATA ABOVE RDL (UG/KG)

DEPTH COMPOUND	8 - 10' S-B1-4	8 - 10' S-B3-4
Chloromethane	U	U
Bromomethane	U	U
Vinyl Chloride	U	U
Chloroethane	U	U
Methylene Chloride	870	U
Acetone	U	10
Carbon Disulfide	U	U
1,1-Dichloroethene	U	U
1,1-Dichloroethane	U	U
Trans-1,2-Dichloroethane	U	U
Chloroform	U	U
1,2-Dichloroethane	U	U
2-Butanone	9500	9
1,1,1-Trichloroethane	U	U
Carbon Tetrachloride	U	U
Vinyl Acetate	U	U
Bromodichloromethane	U	U
1,2-Dichloropropane	U	U
Trans-1,3-Dichloropropene	U	U
Trichloroethene	U	U
Dibromochloromethane	U	U
1,1,2-Trichloroethane	U	U
Benzene	U	U
cis-1,3-Dichloropropene	U	U
2-Chloroethylvinylether	U	U
Bromoform	U	U
4-Methyl-2-Pentanone	U	U
2-Hexanone	U	U
Tetrachloroethene	3100	U
1,1,2,2-Tetrachloroethane	U	U
Toluene	8000	U
Chlorobenzene	U	U
Ethylbenzene	4200	U
Styrene	6400	U
Total Xylenes	31000	U

U= Below CRDL R= Unuseable data

Table 3-3 (cont.)

AUTO ION SITE
SEMIVOLATILES ANALYSIS SUMMARY SHEET FOR SOIL
ALL USEABLE DATA ABOVE CRDL (UG/KG)

DEPTH	0 - 2'	9 - 11'	23.5-25'	2 - 4'	4 - 6'	9 - 11'	14 - 16'
COMPOUND	S-B2-1	S-B2-3	S-B2-7	S-W1-2	S-W1-3	S-W1-4	S-W1-5
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U
Benzoic acid	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U
4-Chloroanitine	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	150
Acenaphthylene	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U
Phenanthrene	U	1700	U	U	U	U	U
Anthracene	11000	370	U	U	U	U	U
Di-n-butylphthalate	3600	U	U	1700	1400	1300	840
Fluoranthene	11000	U	U	U	U	U	U
Pyrene	480	1600	U	U	U	U	U
Butylbenzylphthalate	U	U	U	U	U	1300	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U
Benzo(a)anthracene	U	850	U	U	U	U	U
Chrysene	U	670	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	1400	940	510	1400	690	730
Di-n-octylphthalate	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	890	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U
Benzo(a)pyrene	U	44.	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U

U= Below CRDL   R= Unuseable data

Table 3-3 (cont.)

AUTO ION SITE
SEMIVOLATILES ANALYSIS SUMMARY SHEET FOR SOIL
ALL USEABLE DATA ABOVE CRDL (UG/KG)

DEPTH	19 - 21'	0 - 2'	2 - 4	4 - 6'	4 - 6'	6 - 8'	13.5-15.5'
COMPOUND	S-W1-6	S-W3B-1	S-W3B-2	S-W3B-3A	S-W3B-3B	S-W3B-4	S-W3B-5
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	R	R	R	R	U	R
1,3-Dichlorobenzene	U	U	U	U	U	R	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U
2-Methylphenol	U	R	R	R	R	R	R
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	R	R	R	R	R	R
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	R
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	R	R	R	R	R	R
2,4-Dimethylphenol	U	R	R	R	R	R	R
Benzoic acid	U	U	R	R	R	R	R
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	R	R	R	R	R	R
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	R	R	R	R	R	R
2-Methylnaphthalene	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	R	U	U	U	U	U
2,4,6-Trichlorophenol	U	R	R	R	R	R	R
2,4,5-Trichlorophenol	U	R	R	R	R	R	R
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	R	U	R	R	R	R
4-Nitrophenol	U	R	U	R	R	R	R
Dibenzofuran	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	R	U	U	U	R	U
Fluorene	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	R	U	U	R	R	R
N-nitrosodiphenylamine	U	R	U	U	U	R	U
4-Bromophenyl-phenylether	U	R	U	U	U	R	U
Hexachlorobenzene	U	U	U	U	U	R	U
Pentachlorophenol	U	R	R	U	R	R	R
Phenanthrene	U	U	U	370	U	3000	U
Anthracene	U	U	U	U	U	U	U
Di-n-butylphthalate	1300	520	820	2400	3000	1300	3800
Fluoranthene	U	410	430	370	U	3300	U
Pyrene	U	370	390	330	R	3000	U
Butylbenzylphthalate	U	U	U	U	U	U	U
3,3'-Dichorobenzidine	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	370	U	1700	U
Chrysene	U	U	U	330	U	1400	U
bis(2-Ethylhexyl)phthalate	570	940	1100	7200	8000	U	590
Di-n-octylphthalate	U	U	U	U	U	4900	U
Benzo(b)fluoranthene	U	U	U	R	U	2500	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U
Benzo(a)pyrene	U	U	U	450	360	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U

U= Below CRDL   R= Unuseable data

Table 3-3 (cont.)

AUTO ION SITE
SEMIVOLATILES ANALYSIS SUMMARY SHEET FOR SOIL
ALL USEABLE DATA ABOVE CRQL (UG/KG)

DEPTH	17 - 19'	24-25.5'	29-30.5'	39-40.5'
COMPOUND	S-VJB-6	S-VJB-7	S-VJB-8	S-VJB-10
Phenol	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U
2-Chlorophenol	R	U	U	U
1,3-Dichlorobenzene	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U
Benzyl alcohol	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U
2-Methylphenol	R	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U
4-Methylphenol	R	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U
Hexachloroethane	U	U	U	U
Nitrobenzene	R	U	U	U
Isophorone	U	U	U	U
2-Nitrophenol	R	U	U	U
2,4-Dimethylphenol	R	U	U	U
Benzoic acid	R	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U
2,4-Dichlorophenol	R	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U
Naphthalene	U	U	U	U
4-Chloroaniline	U	U	U	U
Hexachlorobutadiene	U	U	U	U
4-Chloro-3-methylphenol	R	U	U	U
2-Methylnaphthalene	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U
2,4,6-Trichlorophenol	R	U	U	U
2,4,5-Trichlorophenol	R	U	U	U
2-Chloronaphthalene	U	U	U	U
2-Nitroaniline	U	U	U	U
Dimethylphthalate	U	U	U	U
Acenaphthylene	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U
3-Nitroaniline	U	U	U	U
Acenaphthene	U	U	U	U
2,4-Dinitrophenol	R	U	U	U
4-Nitrophenol	R	U	U	U
Dibenzofuran	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U
Diethylphthalate	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U
Fluorene	U	U	U	U
4-Nitroaniline	U	U	U	U
4,6-Dinitro-2-methylphenol	R	U	U	U
N-nitrosodiphenylamine	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U
Hexachlorobenzene	U	U	U	U
Pentachlorophenol	R	U	U	U
Phenanthrene	U	U	U	U
Anthracene	R	U	U	U
Di-n-butylphthalate	3200	2700	R	R
Fluoranthene	U	U	U	U
Pyrene	U	U	U	U
Butylbenzylphthalate	U	[illegible]	1200	1600
3,3'-Dichlorobenzidine	U	U	U	U
Benzo(a)anthracene	U	U	U	U
Chrysene	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	2400	R	R
Di-n-octylphthalate	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U
Benzo(a)pyrene	U	U	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U
3-Nitroaniline	U	U	U	U

U= below CRQL R= Unuseable data

Table 3-4

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	0 - 2'	2 - 4'	2 - 4'	4 - 6'	8 - 10'	13.5-15'	18.5-20'	23.5-25'
METAL	S-B1-1	S-B1-2A	S-B1-2B	S-B1-3	S-B1-4	S-B1-5	S-B1-6	S-B1-7
Aluminum	2672	3318	3392	5000	5585	1816	5236	6400
Antimony	U	U	13.0	U	U	U	U	U
Arsenic	80.0	50.0	62.0	22.0	7.4	2.4	4.9	5.0
Barium	131.0	U	U	35.0	U	U	U	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	1.6	U	1.0	U
Calcium	16200	1909	2319	2094	40700	52600	68800	78700
Chromium	2433.0	960.0	839.0	133.0	94.0	68.0	14.0	14.0
Cobalt	U	U	U	U	U	U	U	U
Copper	181.0	32.0	37.0	50.0	187.0	40.0	9.4	8.7
Iron	45200	20100	23000	24100	15400	5718	10700	11700
Lead	928.0	5.2	6.8	8.5	4.1	3.8	5.4	5.7
Cyanide	4.1	1.2	1.9	R	4.9	R	U	R
Magnesium	1099	U	1006	1492	13500	9506	23200	26200
Manganese	35.0	42.0	52.0	94.0	483.0	145.0	258.0	285.0
Mercury	0.20	U	U	U	U	0.20	U	0.20
Nickel	25.0	6.1	7.9	12.0	131.0	140.0	16.0	16.0
Potassium	3865	1964	2169	1130	U	U	1023	1300
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	U	149
Thallium	U	U	U	U	U	U	U	U
Vanadium	15.0	11.0	12.0	20.0	U	U	12.0	14.9
Zinc	43.0	18.0	19.0	33.0	181.0	100.0	35.0	36.6

U= Below RDL R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	25-26.5'	28.8-30'	33.5-35'	38.5-40'	43.5-45'	48.5-50'	58.5-60'	68.5-70'
METAL	S-B1-8	S-B1-9	S-B1-10	S-B1-11	S-B1-12	S-B1-13	S-B1-14	S-B1-15
Aluminum	2880	3697	1043	2626	774	774	698	667
Antimony	U	R	R	R	R	R	U	U
Arsenic	2.8	2.9	U	2.8	U	U	U	U
Barium	U	U	U	U	U	U	U	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	1.1	U	U	U	U	U	U	U
Calcium	55200	39500	33800	35300	18500	16500	16800	15900
Chromium	8.0	19.0	19.0	17.0	15.0	14.0	12.0	14.0
Cobalt	U	U	U	U	U	U	U	U
Copper	4.6	6.1	U	5.7	U	U	U	U
Iron	6217	11300	2803	5832	2016	1866	1759	1798
Lead	3.8	3.4	1.8	4.1	U	U	U	U
Cyanide	R	U	U	R	0.7	U	R	R
Magnesium	19600	13600	9859	13500	5429	5052	4867	4877
Manganese	174.0	278.0	76.0	171.0	53.0	47.0	50.0	48.0
Mercury	U	U	U	U	U	U	U	U
Nickel	8.5	U	U	11.0	U	U	U	U
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	8.3	U	U	8.9	U	U	U	U
Zinc	22.0	24.0	12.0	24.0	6.1	5.8	7.0	5.3

U= Below RDL R= Unuseable data

Table 3-4 (con't)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	**78.5-80'**	**88.5-90'**	**103.5-105'**	**0 - 2'**	**9 - 11'**	**14 - 16'**	**18.5-20'**	**23.5-25'**
METAL	**S-B1-16**	**S-B1-17**	**S-B1-19**	**S-B2-1**	**S-B2-3**	**S-B2-5**	**S-B2-6**	**S-B2-7**
Aluminum	817	740	744	4309	1792	2799	824	5459
Antimony	U	U	U	R	R	R	R	R
Arsenic	U	U	U	U	U	5.5	U	16.0
Barium	U	U	U	U	U	U	U	85.0
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	19600	24800	26200	73100	7395	49000	18300	63700
Chromium	18.0	53.0	42.0	39.0	91.0	334.0	16.[illegible]	38.0
Cobalt	U	U	U	U	U	U	U	U
Copper	U	U	U	60.0	6.7	13.0	U	25.0
Iron	2323	2233	3790	8572	4970	10900	2662	12300
Lead	U	2.1	U	5.6	6.0	4.9	2.7	27.0
Cyanide	R	R	R	0.3	U	1.2	U	0.9
Magnesium	5499	7365	8650	26300	22600	14600	5687	10500
Manganese	59.0	65.0	121.0	250.0	145.0	217.0	79.0	318.0
Mercury	U	U	U	R	R	R	R	0.30
Nickel	U	U	U	62.0	25.0	56.0	20.0	21.0
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	R	R	R	R	R
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	U	12.0	U	18.0	U	13.0
Zinc	9.4	7.5	9.6	36.0	R	86.0	R	49.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	28.5-30'	0 - 2'	2 - 4'	4 - 6'	4 - 6'	8 - 10'	10 - 12'	13.5-15'
METAL	S-B2-8	S-B3-1	S-B3-2	S-B3-3A	S-B3-3B	S-B3-4	S-B3-5	S-B3-6
Aluminum	11700	4003	3424	2598	3127	11700	1817	1349
Antimony	R	U	U	U	U	U	U	U
Arsenic	20.0	9.7	3.8	3.8	4.8	10.0	11.0	U
Barium	152.0	68.0	52.0	U	47.0	122.0	U	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	1.0	U	U	U	U	U
Calcium	41200	32400	33800	16600	19500	4537	28400	26600
Chromium	535.0	17.0	15.0	7.4	9.3	21.0	7.5	15.0
Cobalt	U	U	U	U	U	U	U	U
Copper	119.0	24.0	16.0	11.0	12.0	12.0	22.0	29.0
Iron	63700	1000	8023	7788	9790	32400	6709	3739
Lead	23.0	42.0	24.0	18.0	19.0	12.0	2.1	U
Cyanide	4.4	0.4	0.6	0.8	0.7	U	R	U
Magnesium	7809	5200	10600	6722	7084	2663	11700	7558
Manganese	1352.0	310.0	239.0	200.0	254.0	168.0	76.0	76.0
Mercury	R	0.20	U	U	U	U	U	U
Nickel	89.0	16.0	12.0	U	8.7	9.6	30.0	37.0
Potassium	2971	U	U	2570	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	5339	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	30.0	12.0	11.0	U	11.0	31.0	U	U
Zinc	145.0	49.0	42.0	36.0	38.0	67.0	27.0	39.0

U= Below RDL R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	23.5-25'	28.5-30'	33.5-35'	38.5-40'	43.5-45'	48.5-50'	58.5-60'	68.5-70'
METAL	S-B3-8	S-B3-9	S-B3-10	S-B3-11	S-B3-12	S-B3-13	S-B3-14	S-B3-15
Aluminum	930	779	706	799	1100	1017	709	818
Antimony	U	U	U	U	U	U	U	U
Arsenic	U	U	0.0	U	U	U	U	U
Barium	U	U	U	U	U	U	U	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	18800	19300	21900	24300	24600	25900	22900	20000
Chromium	40.0	15.0	10.0	10.0	11.0	59.0	9.2	12.0
Cobalt	U	U	U	U	U	U	U	U
Copper	U	U	U	U	U	7.9	U	U
Iron	2069	2024	2124	2123	3148	2681	2215	2191
Lead	U	1.7	U	U	U	U	U	U
Cyanide	U	U	U	U	U	U	U	U
Magnesium	5556	5688	6690	7236	7134	9565	7418	7135
Manganese	55.0	47.0	49.0	51.0	75.0	79.0	69.0	65.0
Mercury	U	U	U	U	U	2.00	0.60	U
Nickel	U	U	U	U	U	10.0	U	U
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	U	U	U	U	U	U
Zinc	7.5	7.6	9.6	6.2	6.8	21.0	15.0	6.[illegible]

U= Below RDL   F= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	78.5-80'	88.5-90'	0 - 2'	2 - 4'	4 - 6'	6 - 8'	6 - 8'	0 - 2'
METAL	S-B3-16	S-B3-17	S-B4-1	S-B4-2	S-B4-3	S-B4-4A	S-B4-4B	S-B5-1
Aluminum	717	2141	3005	1734	2988	4803	5013	2668
Antimony	U	R	R	R	R	R	R	R
Arsenic	U	U	5.7	3.8	3.4	11.0	8.3	18.0
Barium	U	U	U	U	U	585.0	517.0	80.0
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	21200	91200	51400	72100	35500	43500	28400	26800
Chromium	18.0	174.0	25.0	18.0	19.0	2958.0	2561.0	371.0
Cobalt	U	U	U	U	U	U	U	U
Copper	U	12.0	13.0	7.1	16.0	949.0	824.0	154.0
Iron	1943	7223	13600	5502	6372	17900	17600	16600
Lead	U	5.0	8.7	1.9	7.2	34.0	23.0	62.0
Cyanide	U	3.2	3.0	0.4	R	183.0	231.0	4.3
Magnesium	6540	12500	15100	27000	11400	14400	9711	7751
Manganese	57.0	221.0	299.0	138.0	182.0	289.0	311.0	142.0
Mercury	U	0.10	U	U	U	U	U	0.20
Nickel	16.0	27.0	23.0	12.0	15.0	1449.0	1159.0	408.0
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	R	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	17.0	U	7.9	11.0	U	10.0
Zinc	7.6	106.0	29.0	22.0	32.0	539.0	435.0	201.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	2 - 4'	4 - 6'	6 - 8'	0 - 2'	2 - 4'	4 - 6'	0 - 2'	2 - 4'
METAL	S-B5-2	S-B5-3	S-B5-4	S-B6-1	S-B6-2	S-B6-3	S-B7-1	S-B7-2A
Aluminum	3665	3754	1470	3128	7837	2816	3295	2489
Antimony	R	R	R	R	R	R	R	R
Arsenic	3.4	3.8	2.6	38.0	9.0	4.3	3.4	R
Barium	43.0	U	U	280.0	U	54.0	U	294.0
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	9.2	2.5	U	U	4.7
Calcium	1624	1013	3013	27400	43800	14100	55200	31600
Chromium	313.0	409.0	349.0	1207.0	1423.0	310.0	53.0	2572.0
Cobalt	U	U	U	U	U	U	U	U
Copper	40.0	146.0	133.0	1203.0	642.0	143.0	46.0	4141.0
Iron	13600	10500	9251	16500	12800	9082	7480	R
Lead	5.9	3.9	4.4	365.0	15.0	22.0	8.2	129.0
Cyanide	1.2	27.0	124.0	0.9	17.0	2.6	6.4	R
Magnesium	1131	1102	U	8636	9326	4038	17700	6722
Manganese	145.0	62.0	40.0	201.0	114.0	106.0	239.0	128.0
Mercury	U	U	U	0.20	U	0.10	0.20	0.40
Nickel	64.0	166.0	517.0	1020.0	1022.0	576.0	72.0	4520.0
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	12.0	11.0	U	9.9	14.0	U	U	U
Zinc	21.0	38.0	146.0	1474.0	364.0	301.0	43.0	2029.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	**2 - 4'**	**4 - 6'**	**6 - 8'**
METAL	**S-B7-2B**	**S-B7-3**	**S-B7-4**
Aluminum	3113	6266	2305
Antimony	R	R	R
Arsenic	R	0.0	27.0
Barium	277.0	97.0	U
Beryllium	U	U	U
Cadmium	1.6	12.0	U
Calcium	32500	19800	5276
Chromium	1440.0	3521.0	2071.0
Cobalt	U	24.0	U
Copper	1831.0	10100.0	617.0
Iron	R	14200	6776
Lead	140.0	30.0	6.5
Cyanide	R	4.0	15.0
Magnesium	6899	3686	1114
Manganese	98.0	54.0	29.0
Mercury	0.80	1.60	U
Nickel	2061.0	1094.0	85.0
Potassium	U	U	U
Selenium	U	U	U
Silver	U	4.4	U
Sodium	U	U	U
Thallium	U	U	U
Vanadium	U	18.0	U
Zinc	790.0	589.0	24.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	0 - 2'	2 - 4'	4 - 6'	9 - 11'	14 - 16'	19 - 21'	0 - 2'	0 - 2'
METAL	S-W1-1	S-W1-2	S-W1-3	S-W1-4	S-W1-5	S-W1-6	S-W2-1A	S-W2-1B
Aluminum	5243	3340	7119	2719	881	1273	R	R
Antimony	R	R	R	R	R	R	R	R
Arsenic	4.5	3.5	10.0	U	U	U	U	U
Barium	40.0	U	69.0	U	U	U	R	R
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	21400	16300	9985	64100	37500	43100	R	R
Chromium	11.0	7.1	15.0	9.4	7.0	9.0	13.0	38.0
Cobalt	U	U	U	U	U	U	U	U
Copper	12.0	18.0	7.5	U	U	U	U	26.0
Iron	9694	10500	20400	5996	3804	4760	R	R
Lead	23.0	30.0	13.0	2.1	1.3	2.1	9.5	37.0
Cyanide	R	R	R	R	R	R	U	U
Magnesium	6135	6146	3850	10200	12100	11800	5566	11500
Manganese	287.0	276.0	1006.0	130.0	122.0	110.0	R	R
Mercury	0.02	U	U	U	U	U	R	R
Nickel	7.9	U	9.7	U	U	U	23.0	18.0
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	5.0	4.9
Vanadium	11.0	U	24.0	U	U	U	U	U
Zinc	40.0	42.0	33.0	14.0	13.0	14.0	24.0	54.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	2 - 4'	4 - 6'	9 - 11'	17 - 19'	0 - 2'	2 - 4	4 - 6'	4 - 6'
METAL	S-W2-2	S-W2-3	S-W2-4	S-W2-5	S-W3B-1	S-W3B-2	S-W3B-3A	S-W3B-3B
Aluminum	6439	4740	957	2949	4464	2033	8912	7198
Antimony	R	R	R	R	U	U	U	U
Arsenic	U	5.8	U	7.4	4.5	U	38.0	U
Barium	75.0	U	U	U	45.0	71.0	R	R
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	4.8	U	U	U
Calcium	22300	U	32500	66000	47600	13900	29700	22200
Chromium	177.0	18.0	13.0	27.0	1010.0	681.0	1798.0	2116.0
Cobalt	U	U	U	U	U	U	U	U
Copper	28.0	U	U	6.4	445.0	222.0	444.0	663.0
Iron	17600	101200	3067	9458	14600	42700	26900	24500
Lead	4.7	4.2	3.5	5.5	70.0	28.0	60.0	66.0
Cyanide	U	U	U	U	R	R	R	5.3
Magnesium	4145	1167	7019	14600	15500	U	U	U
Manganese	421.0	224.0	82.0	301.0	243.0	47.0	184.0	135.0
Mercury	R	R	R	R	0.20	1.80	4.10	5.10
Nickel	87.0	U	U	41.0	333.0	112.0	651.0	431.0
Potassium	1402	U	U	U	U	2383	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	4235	U	U	U	U	U	U	U
Thallium	U	4.4	U	U	U	U	U	U
Vanadium	14.0	13.0	U	U	14.0	14.0	16.0	16.0
Zinc	92.0	16.0	8.7	24.0	631.0	57.0	720.0	506.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	6 - 8'	13.5-15.5'	17 - 19'	24-25.5'	29-30.5'	34-35.5'	39-40.5'	44-45.5'
METAL	S-W3B-4	S-W3B-5	S-W3B-6	S-W3B-7	S-W3B-8	S-W3B-9	S-W3B-10	S-W3B-11
Aluminum	3098	2375	6855	1170	691	591	542	934
Antimony	U	U	U	22.0	U	U	U	U
Arsenic	U	4.0	U	U	U	U	U	U
Barium	U	U	U	U	U	U	U	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	5589	42000	72200	23100	17200	15900	15900	20700
Chromium	1863.0	205.0	26.0	16.0	11.0	13.0	12.0	13.0
Cobalt	U	U	U	U	U	U	U	U
Copper	1135.0	47.0	7.8	U	U	U	U	U
Iron	13600	9293	12800	2660	1630	1580	1540	2480
Lead	21.0	3.4	4.0	U	U	U	U	U
Cyanide	R	U	U	U	U	U	U	U
Magnesium	1323	12100	25500	7500	4260	4710	4510	5820
Manganese	64.0	194.0	283.0	66.0	41.0	44.0	41.0	56.0
Mercury	0.40	0.10	R	U	U	U	U	U
Nickel	477.0	184.0	16.0	U	U	U	U	U
Potassium	U	U	1539	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	8.5	U	U
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	17.0	U	U	U	U	U
Zinc	111.0	212.0	34.0	8.7	U	U	U	7.3

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	49-50.5'	0 - 2'	2 - 4'	4 - 6'	9 - 11'	9 - 11'	12 - 14'	19 - 21'
METAL	S-W3B-12	S-W4-1	S-W4-2	S-W4-3	S-W4-4A	S-W4-4B	S-W4-5	S-W4-6
Aluminum	925	3624	2165	1533	2775	1352	4432	2074
Antimony	U	R	R	R	R	R	R	R
Arsenic	U	14.0	9.4	5.0	5.8	3.6	19.0	U
Barium	U	208.0	118.0	49.0	U	U	640.0	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	2.4	U	1.4	U	U	U	U
Calcium	15800	29600	1549	2111	4593	2538	133600	67000
Chromium	14.0	1601.0	1050.0	111.0	990.0	887.0	22.0	69.0
Cobalt	U	5.0	U	U	U	U	U	U
Copper	U	413.0	467.0	62.0	41.0	36.0	U	14.0
Iron	2120	22200	19900	9549	10200	7834	29800	8422
Lead	U	184.0	45.0	43.0	9.6	5.2	49.0	2.5
Cyanide	U	72.0	33.0	2.7	5.8	7.7	R	1.4
Magnesium	4820	7293	U	U	U	U	8299	15100
Manganese	49.0	190.0	30.0	63.0	R	R	1838.0	192.0
Mercury	U	0.30	0.20	0.20	U	U	0.30	U
Nickel	U	298.0	108.0	184.0	63.0	22.0	4.9	52.0
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	2597	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	14.0	14.0	U	U	U	U	U
Zinc	5.6	174.0	113.0	247.0	R	R	39.0	78.0

U= Below RDL R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	0 - 2'	2 - 4'	6 - 8'	6 - 8'	8 - 10'	14 - 16'	24 - 26'	0 - 2'
METAL	S-W5-1	S-W5-2	S-W5-4A	S-W5-4B	S-W5-5	S-W5-6	S-W5-7	S-W6-1
Aluminum	2874	3518	43	5762	4525	3399	2517	4167
Antimony	R	R	R	R	R	U	U	U
Arsenic	16.0	23.0	R	R	20.0	9.7	7.2	21.0
Barium	142.0	128.0	371.0	392.0	76.0	U	U	102.0
Beryllium	U	U	U	U	U	U	U	1.3
Cadmium	U	U	2.7	U	U	U	U	1.2
Calcium	4181	6591	10600	11400	111800	76000	95300	16300
Chromium	858.0	1045.0	2508.0	1782.0	33.0	200.0	107.0	479.0
Cobalt	U	U	U	U	U	U	U	U
Copper	339.0	357.0	1258.0	1396.0	13.0	74.0	35.0	105.0
Iron	16400	19600	20900	25000	21600	12600	7590	10600
Lead	190.0	109.0	374.0	833.0	7.6	5.1	3.6	109.0
Cyanide	61.0	66.0	487.0	574.0	24.0	U	U	74.0
Magnesium	U	1340	3112	2174	5576	17500	19900	6667
Manganese	71.0	82.0	90.0	89.0	1039.0	180.0	277.0	225.0
Mercury	0.50	0.60	0.20	0.20	R	U	U	U
Nickel	81.0	67.0	2957.0	1521.0	35.0	155.0	68.0	54.0
Potassium	U	U	2241	3361	U	U	U	U
Selenium	U	U	U	U	R	U	U	2.0
Silver	U	U	U	U	U	U	U	3.3
Sodium	R	R	1606	2554	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	11.0	14.0	15.0	21.0	U	12.0	U	15.0
Zinc	63.0	54.0	469.0	R	57.0	108.0	66.0	60.0

U= Below RDL   R= Unuseable data

Table 3-4 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SOILS
ALL USEABLE DATA ABOVE RDL (MG/KG)

DEPTH	2 - 4'	4 - 6'	6 - 8'	9 - 11'	12 - 14'	12 - 14'	14 - 16'	19 - 21'
METAL	S-W6-2	S-W6-3	S-W6-4	S-W6-5	S-W6-6A	S-W6-6B	S-W6-7	S-W6-8
Aluminum	4929	7313	4638	10600	3072	4173	2985	1734
Antimony	U	U	U	U	U	U	U	U
Arsenic	27.0	U	R	15.0	12.0	7.4	U	U
Barium	51.0	95.0	222.0	566.0	U	U	U	U
Beryllium	1.1	1.7	1.4	U	U	U	U	U
Cadmium	1.4	1.5	U	U	U	U	U	U
Calcium	11400	17900	1936	57300	76400	80500	42900	58100
Chromium	150.0	157.0	986.0	120.0	70.0	159.0	272.0	32.0
Cobalt	U	U	U	15.0	U	U	U	U
Copper	50.0	69.0	633.0	19.0	U	11.0	27.0	5.5
Iron	12000	31400	25000	46500	11400	13200	9139	6176
Lead	61.0	38.0	37.0	30.0	12.0	5.0	24.0	2.9
Cyanide	R	R	R	R	R	R	R	R
Magnesium	3512	1751	U	7309	6146	6193	8501	10600
Manganese	500.0	237.0	30.0	826.0	650.0	712.0	205.0	112.0
Mercury	0.20	0.20	U	U	U	U	U	U
Nickel	62.0	41.0	484.0	31.0	16.0	18.0	35.0	15.0
Potassium	U	U	1533	U	U	U	U	U
Selenium	U	U	U	U	1.3	1.3	U	U
Silver	1.5	U	2.9	U	U	U	U	U
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	14.0	32.0	29.0	31.0	U	U	14.0	U
Zinc	71.0	61.0	65.0	77.0	23.0	26.0	22.0	13.0

U= Below RDL R= Unuseable data

Table 3-5

AUTO ION SITE
PESTICIDE/PCB ANALYSIS SUMMARY SHEET FOR SOIL
ALL USEABLE DATA ABOVE RDL (UG/KG)

DEPTH COMPOUND	18.5-20' S-B2-6	29-30.5' S-W3B-8	34-35.5' S-W3B-9	39-40.5' S-W3B-10	44-49.5' S-W3B-11	49-50.5' S-W3B-12
alpha-BHC	U	U	U	U	U	U
beta-BHC	U	9.39	15.00	15.00	7.80	28.00
delta-BHC	U	U	U	U	U	U
gamma-BHC (Lindane)	U	U	U	U	U	U
Heptachlor	8.50	U	U	U	U	U
Aldrin	U	U	U	U	U	U
Heptachlor epoxide	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U
4,4'-DDE	U	U	U	U	U	U
Endrin	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U
4,4'-DDD	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U
4,4'-DDT	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U
Aroclor-1016	U	U	U	U	U	U
Aroclor-1221	U	U	U	U	U	U
Aroclor-1232	U	U	U	U	U	U
Aroclor-1242	U	U	U	U	U	U
Aroclor-1248	U	U	U	U	U	U
Aroclor-1254	U	U	U	U	U	U
Aroclor-1260	U	U	U	U	U	U

U= Below RDL R= Unuseable data

Of the fourteen borings on the Site ten (W-2, W-4, W-5, W-6, B-1, B-4, B-5, B-6, and B-7) were sampled for inorganics only and three (W-1, W-3b and B-2) were sampled for inorganics, volatile organics, semivolatiles and pesticides/PCB's. Boring W-3a was not sampled as it was in the immediate vicinity of W-3b.

Inorganic concentrations were compared to the values shown in Table 3-6 which list values of Typical Element Concentrations in Natural Soils adapted from: Hazardous Waste Land Treatment, USEPA., SW 874 (April, 1983). In the background boring W-1, magnesium was present in concentrations ranging from 6,135 to 12,100 mg/kg; these are above the typical range for magnesium as shown in Table 3-6. All other inorganics identified were within or below concentrations considered typical.

Boring W-2 also had magnesium (7,019-14,600 mg/kg) above the normal range. Cyanide (5.1 mg/kg) was detected in the upper two feet below the surface. Boring W-3b had antimony (22 mg/kg), cadmium (4.8 mg/kg), chromium (1,010-2,116 mg/kg), copper (1135 mg/kg), magnesium (7,500-25,500 mg/kg), mercury (0.4-5.1 mg/kg), nickel (651 mg/kg), silver (8.5 mg/kg) and zinc (506-720 mg/kg) all above typical concentrations. These compounds were contained in the upper eight feet except for magnesium, antimony and silver. All other inorganics identified were within or below typical concentrations.

Boring W-4 had cadmium (2.4 mg/kg), chromium (1,601-1,050 mg/kg) copper (413 mg/kg), and magnesium (7,293-15,100 mg/kg) present above typical concentrations. Cyanide (1.4-72 mg/kg) was detected with the highest concentration (72 mg/kg) detected within two feet of the surface.

Boring W-5 detected concentrations of cadmium (2.7 mg/kg), chromium (1,045-2,508 mg/kg), copper (339-1,396 mg/kg, lead (374-893 mg/kg), mercury (0.5-0.6 mg/kg), magnesium (17,500-19,900 mg/kg), nickel (1521-2957 mg/kg) and zinc (469 mg/kg) above typical values. In addition, cyanide (61-574 mg/kg) was detected above typical ranges in the upper eight feet of the boring.

TABLE 3-6

AUTO ION
TYPICAL ELEMENT CONCENTRATIONS IN NATURAL SOILS
IN mg/Kg

ELEMENT	RANGE	AVERAGE	ELEMENT	RANGE	AVERAGE
Aluminum	10,000-300,000	71,000	Lithium	5-200	20
Antimony	2-10	-	Magnesium	600-6,000	5,000
Arsenic	1-50	5	Manganese	20-3,000	600
Barium	100-3,000	430	Mercury	0.00-0.03	.03
Beryllium	0.1-40	6	Molybdenum	0.2-5	2
Boron	2-100	10	Nickel	5-500	40
Bromine	1-10	5	Radium	$8x10^{-5}$	-
Cadmium	0.01-0.7	.06	Rubidium	50-500	10
Cesium	0.3-25	6	Selenium	0.1-2	.3
Chlorine	20-900	100	Silver	0.01-5	.05
Chromium	1-1,000	100	Strontium	50-1,000	200
Cobalt	1-40	8	Tin	2-200	10
Copper	2-100	30	Tungsten	-	1
Flourine	10-4,000	200	Uranium	0.9-9	1
Gallium	0.4-300	30	Vanadium	20-500	100
Gold	-	1	Yttrium	25-200	50
Iodine	0.1-40	5	Zinc	10-300	50
Lanthanum	1-5,000	30	Zirconium	60-2,000	300
Lead	2-200	10			

Adapted from: Hazardous Waste Land Treatment, U.S. EPA, SW 874 (April, 1983)

Boring W-6 had concentrations of cadmium (1.2-1.5 mg/kg), copper (105-633 mg/kg), magnesium (6,146-10,600 mg/kg) and silver (2.5-3.3 mg/kg). Cyanide (74 mg/kg) was identified in the upper two feet, while all of the cadmium, copper and silver were in the upper eight feet.

Boring B-1 had antimony (13 mg/kg), arsenic (62 mg/kg), cadmium (1-1.6 mg/kg), chromium (2,433 mg/kg) copper (181-187 mg/kg), lead (928 mg/kg), and magnesium (7,365-26,200 mg/kg) above typical concentrations. Cyanide (0.7-4.9 mg/kg) was also identified. Most of the inorganics identified were recovered in the upper eight feet with the exception of magnesium, found throughout the sample, cadmium found at twenty (1.0 mg/kg) and twenty five feet (1.1 mg/kg) and cyanide (0.7 mg/kg) at 45 feet.

Boring B-2 had copper (119 mg/kg) and magnesium (7,809-26,300 mg/kg) above typical concentrations. Cyanide (0.32-4.4 mg/kg) was identified throughout the boring to a depth of 30 feet below the surface.

Boring B-3 had magnesium (6540-12,500 mg/kg) through out the boring. Cadmium (1 mg/kg) was detected in the upper 6 feet as well as at a depth of 100 feet below the surface. Mercury was found between 50 to 60 feet below the surface.

Boring B-4 had cadmium (1.4 mg/kg), chromium (2,561-2,968 mg/kg), copper (824-949 mg/kg), nickel (1,159-1,449 mg/kg), magnesium (9,711-27,000 mg/kg) and zinc (435-539 mg/kg) above typical concentrations. Cyanide (0.4-231 mg/kg) was identified with the highest concentration at 6-8 feet below the surface. The highest concentrations for chromium, copper, nickel and zinc were detected 6-8 feet below the surface.

Boring B-6 had cadmium (2.5-9.2 mg/kg), chromium (1207-1423 mg/kg), copper (143-1209 mg/kg), lead (365 mg/kg), magnesium (8636-9326 mg/kg), nickel (576-1022 mg/kg) and zinc (301-1474 mg/kg) above typical concentrations. Cyanide (0.9-17 mg/kg) was also identified throughout the boring.

Boring B-7 had cadmium (1.6-12 mg/kg), chromium (1,440-3,521 mg/kg), copper (617-10,100 mg/kg), magnesium (6,722-17,700 mg/kg), mercury (0.14-1.6 mg/kg), nickel (1,094-4,520 mg/kg), and zinc (589-2,029 mg/kg) above typical concentrations. Cyanide (4-15 mg/kg) was also identified 4-8 feet below surface.

Volatile samples were collected in three borings at the Site. The results starting with W-1 identified 2-Butanone (58 ug/kg) at 19-21 feet below the surface. The results of samples from boring W-3B indicated the presence of methylene chloride (18-32 ug/kg), acetone (14110 ug/kg), trichloroethene (5596 ug/kg), tetrachloroethene (12 ug/kg), toluene (12-65 ug/kg) and ethylbenzene (6 ug/kg). Most of the volatiles identified were in the upper eight feet. The results of samples from boring B-2 showed acetone (19-76 ug/kg), 2-butanone (33-57 ug/kg), trichloroethene (34 ug/kg), and toluene (5 ug/kg). These compounds were identified at two feet (2-butanone, toluene, eleven feet (acetone), twenty feet (acetone, trichloroethene), and at thirty feet (2-butanone). Butylbenzylphthalate (910-1600 ug/kg) was found from 24-40 feet, benzo (a) anthracene (240-1700 ug/kg) from 4-8 feet, bis (2-ethylhexyl) phthalate (590-8000 ug/kg) from 0-40 feet, chrysene (220-1400 ug/kg) from 0-8 feet, di-n-octyl phthalate (39-5,900 ug/kg) from 6-30 feet, benzo (b) fluoranthene (430-2,500 ug/kg) at 4 feet and the 6-8 foot interval, and benzo (a) pyrene (190-450 ug/kg) from 0-4 feet.

Two additional samples not required by the work plan were collected based on a visual assessment. Sample from B-1 at 8-10 feet identified methylene chloride (870 ug/kg), 2-butanone (9,500 ug/kg), ethylbenzene (4,200 ug/kg), styrene (6,400 ug/kg), toluene (8,000 ug/kg), tetrachloroethene (3,100 ug/kg) and total xylenes (31,000 ug/kg). The second sample from B-3 at 8-10 feet identified the presence of acetone (10 ug/kg).

Semivolatiles were analyzed for in samples from borings W-1, W-3b and B-2. Boring W-1 identified the presence of di-n-butylphthalate (840-1,700 ug/kg), from 0-21 feet, butylbenzylphthalate (1300 ug/kg) at 11 feet and bis(2-ethylhexyl)phthalate (510-1400 ug/kg) from 0-21 feet.

In boring W-3B the semivolatiles identified were phenanthrene (3,000 ug/kg) at 8 feet, di-n-butylphthalate (520-3800 ug/kg) at 0-40 feet, fluoranthene (370-3000 ug/kg) at 0-8 feet, and pyrene (330-3000 ug/kg) at 0-8 feet.

The semivolatiles identified in boring B-2 were phenanthrene (1,700 ug/kg) at 9-11 feet, anthracene (370-1,100 ug/kg) at 0-11 feet, Di-n-Butylphthalate (3,600 ug/kg) at 0-2 feet, fluoranthene (11,000 ug/kg) at 0-2 feet, pyrene (480-1,600 ug/kg) at 0-11 feet, benzo (a) anthracene (850 ug/kg) at 9-11 feet, bis(2-ethylhexyl)phthalate (940-1,400 ug/kg) at 9-11 and 23-25 feet, chrysene (670 ug/kg) at 9-11 feet, benzo (b) fluoranthene (890 ug/kg) at 9-11 feet, and benzo(a)pyrene (440 ug/kg) at 9-11 feet. Of the three borings analyzed for pesticides and PCB's, no PCB's were found and only two had pesticides present. Beta-BHC (9.39-28 ug/kg) was detected at a depth of 29-50 feet and was the only pesticide identified in W-3b. In boring B-2 the pesticide Heptachlor (8.5 ug/kg) was detected at 18-20 feet.

3.3 Monitoring Well Installation

3.3.1 Purpose. HART installed a total of seven groundwater monitoring wells at the Auto Ion Site (Figure 3-B). Six of these wells straddle the water table while the remaining well was set deeper into the aquifer and adjacent to a shallow well in order to assess the presence of a vertical hydraulic gradient. These wells were installed to provide necessary hydrologic and chemical data needed to determine groundwater flow direction, potential contaminant migration and to establish background levels of chemicals in groundwater.

3.3.2 Methodology. The installation of monitoring wells, supervised by HART was based on lithologic information obtained during borehole advancement. Each well was constructed of two inch diameter, stainless

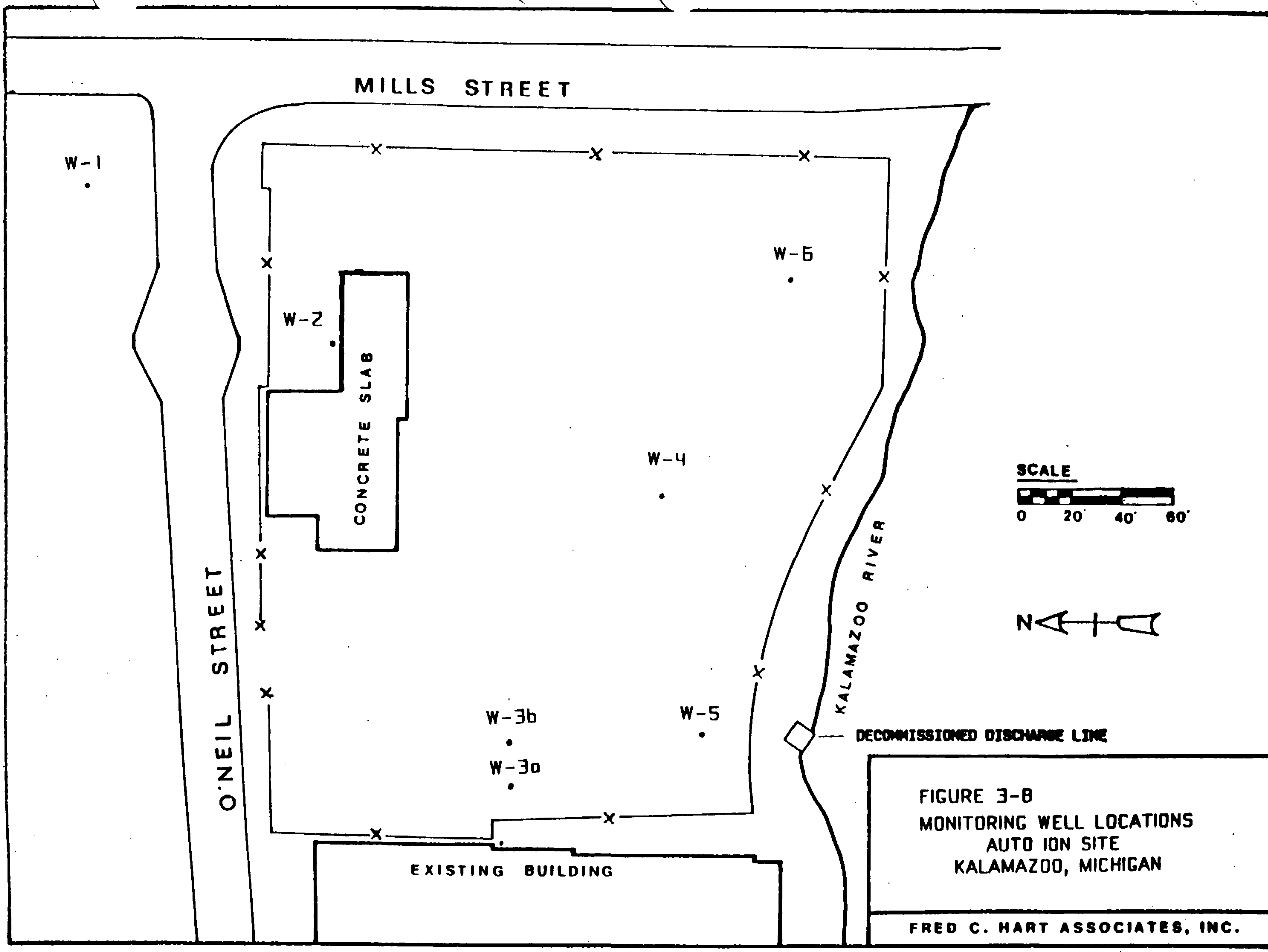


FIGURE 3-8
MONITORING WELL LOCATIONS
AUTO ION SITE
KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

steel (threaded flush joint) and 10.7 foot long, no. 10 slotted, stainless steel screen; these were installed immediately after drilling in the selected test borings.

Installation procedures were the same for all monitoring wells. The wells were emplaced at the desired depth through the hollow stem augers and held in place while the annulus was backfilled with silica sand to approximately two feet above the screen. The augers were periodically retracted from the borehole throughout construction. A bentonite seal consisting of approximately two feet of bentonite pullets was then placed above the sand. A 5% bentonite and cement mixture served to grout the borehole up to two feet below the ground surface. Pure cement was placed above the bentonite/cement slurry to the surface. A protective steel casing was then set in the borehole and cemented in place. A cement collar was constructed around the steel casing to prevent any surface water from draining into the well. All wells were labelled and given locking caps. Monitoring well construction diagrams are contained in Appendix VI. Following installation, four of the wells were developed by pumping; the remaining three were developed by introducing nitrogen gas into the well allowing water to bubble out via an educator pipe until water from the well was visibly free of sediment because of pump failure. The purpose of the well development was to create a good hydraulic connection between the well and the aquifer by removing formational fines. All development water was collected and stored for future disposal.

3.4 Sampling and Analysis of Monitoring Wells

3.4.1 Purpose. Monitoring well water samples were collected on November 3, 1987 and March 8,1988. Sampling was required in order to assess the condition of the groundwater in the aquifer underlying the Site as well as to establish background levels. A total of seven wells were sampled during each sampling event.

3.4.2 Methodology. Before sampling, each well was evacuated of at least five well volumes with a decontaminated stainless steel bottom loading bailer. Samples were then collected by pouring the water from the bailer directly into laboratory supplied bottles and vials. The bailer was decontaminated between wells and a new rope was used for each sampling. All samples were kept at 4°C and transported to Century Laboratories, Inc. of Thorofare, NJ and United States Testing Company, Inc. of Hoboken, NJ.

3.4.3 Findings. Groundwater sampling parameters can be found in Table 3-7. A summary of laboratory data is displayed in Tables 3-8 and 3-9 with the actual laboratory generated data in Appendix V. A comparison of the analytical results for sampling rounds 1 and 2 are presented in Table 3-10. Required Detection Limits (RDL) for the analytical results are listed in Table 3-11. Required Detection Limits are optimum levels of analytical instrument response which may or may not be met in practice.

Analytical results for organic compounds at W-1, the background location, indicate positive results for tetrachloroethene in both sampling rounds. Concentrations of 7 ug/L and 6 ug/L were indicated in sampling rounds 1 and 2 respectively. Inorganics commonly found in groundwater and detected at this location during the first round of sampling included calcium, magnesium, manganese, potassium and sodium at 156,000.0, 41,800.0, 16.0, 5,720.0 and 163,000.0 ug/L respectively. The second round of sampling indicated the presence of aluminum at 38,600 ug/L, barium at 384 ug/L, calcium at 427,000, cadmium at 13 ug/L, chromium at 277ug/L, cobalt at 71 ug/L, iron at 220,000 ug/L, lead at 200 ug/L, magnesium at 117,000 ug/L, manganese at 5,370 ug/L, mercury at 0.30 ug/L, nickel at 225 ug/L, potassium at 8,310, sodium at 140,000, vanadium at 108 ug/L and zinc at 521 ug/L.

Analyses of W-2 confirmed the presence of volatile compounds trichloroethene at 5 ug/L and chloroform at 6 ug/L during the first round of sampling and chloroform again at 31 ug/L during the second round. The only semi-volatile detected was diethylphthalate, at 22 ug/L, on the second round of sampling at W-2. The first round of inorganic sampling at W-2 resulted in the detection of aluminum at 74,600 ug/L, arsenic at 31, barium at 4,340 ug/L, beryllium 111 ug/L, cadmium at 39 ug/L, calcium at 961,000 ug/L, chromium at 1,000 ug/L, cobalt at 312 ug/L, copper at 473 ug/L.

TABLE 3-7

GROUNDWATER SAMPLING PARAMETERS, ROUND 1

Monitoring Wells *	Sample Number	Parameter	
W1	GW-W1	VOA, BN/A, Metals (unfiltered), Cyanide (unfiltered), Hexavalent Chromium, Pesticides, TDS, TSS	
W2	GW-W2	"	"
W3a	GW-W3a	"	"
W3b	GW-W3b	"	"
W4	GW-W4	"	"
W5	GW-W5	"	"
W6	GW-W6	"	"
WB	GW-WB	"	"

TABLE 3-7 (CONTINUED)

GROUNDWATER SAMPLING PARAMETERS, ROUND 2

Monitoring Well *	Sample Number	Parameter	
W1	GW-W1-2	VOA, BN/A, Metals, Cyanide Hexavalent Chromium	
W2	GW-W2-2	"	"
W3a	GW-W3a-2	"	"
W3a	GW-W3a-2d	"	"
W3b	GW-W3b-2	"	"
W4	GW-W4-2	"	"
W5	GW-W5-2	"	"
W6	GW-W6-2	"	"
WB	GW-WB-2	"	"

* WB DENOTES SAMPLE BLANK

Table 3-8

AUTO ION SITE
ROUND 1 ORGANIC ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

COMPOUND	GW-W1	GW-W2	GW-W3A	GW-W3B	GW-W4	GW-W4D	GW-W5
Chloromethane	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Vinyl Chloride	U	U	5	U	35	40	24
Chloroethane	U	U	U	U	U	U	U
Methylene Chloride	U	U	11	U	560	550	6
Acetone	U	R	R	R	R	R	R
Carbon Disulfide	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Trans-1,2-Dichloroethane	U	U	86	U	170	180	U
Chloroform	U	6	U	U	95	90	U
1,2-Dichloroethane	U	U	U	U	45	45	U
2-Butanone	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	5	91	U	410	420	15
Dibromochloromethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
2-Chloroethylvinylether	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	7	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Total Xylenes	U	U	U	U	U	U	U

U= Below RDL R= Unuseable data D= Duplicate

Table 3-8 (cont.)

AUTO ION SITE
ROUND 1 ORGANIC ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

COMPOUND	GW-W6	GW-WB
Chloromethane	U	U
Bromomethane	U	U
Vinyl Chloride	U	U
Chloroethane	U	U
Methylene Chloride	U	U
Acetone	R	R
Carbon Disulfide	U	U
1,1-Dichloroethene	U	U
1,1-Dichloroethane	U	U
Trans-1,2-Dichloroethane	U	U
Chloroform	U	0
1,2-Dichloroethane	U	U
2-Butanone	U	U
1,1,1-Trichloroethane	U	U
Carbon Tetrachloride	U	U
Vinyl Acetate	U	U
Bromodichloromethane	U	5
1,2-Dichloropropane	U	U
Trans-1,3-Dichloropropene	U	U
Trichloroethene	U	U
Dibromochloromethane	U	U
1,1,2-Trichloroethane	U	U
Benzene	U	U
cis-1,3-Dichloropropene	U	U
2-Chloroethylvinylether	U	U
Bromoform	U	U
4-Methyl-2-Pentanone	U	U
2-Hexanone	U	U
Tetrachloroethene	U	U
1,1,2,2-Tetrachloroethane	U	U
Toluene	U	U
Chlorobenzene	U	U
Ethylbenzene	U	U
Styrene	U	U
Total Xylenes	U	U

U= Below RDL R= Unuseable data WB= Blank sample

Table 3-8 (cont.)

AUTO ION SITE
ROUND 2 ORGANIC ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

COMPOUND	GW-WE-2	GW-W1-2	GW-W2-2	GW-W3A-2	GW-W3AD2	GW-W3B-2	GW-W4-2
Chloromethane	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Methylene Chloride	U	U	U	U	U	F	F
Acetone	U	U	U	U	U	U	U
Carbon Disulfide	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Trans-1,2-Dichloroethene	U	U	U	150	91	U	16
Chloroform	U	U	31	U	U	U	19
1,2-Dichloroethane	U	U	U	U	U	U	U
2-Butanone	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	U	100	62	U	160
Dibromochloromethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
2-Chloroethylvinylether	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	6	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Total Xylenes	U	U	U	U	U	U	U

U= Below RDL F= Unuseable data UB= Blank sample

Table 3-8 (cont.)

AUTO ION SITE
ROUND 2 ORGANIC ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

COMPOUND	GW-W5-2	GW-W6-2
Chloromethane	U	U
Bromomethane	U	U
Vinyl Chloride	U	U
Chloroethane	U	U
Methylene Chloride	R	U
Acetone	U	U
Carbon Disulfide	U	U
1,1-Dichloroethene	U	U
1,1-Dichloroethane	U	U
Trans-1,2-Dichloroethane	U	U
Chloroform	U	U
1,2-Dichloroethane	U	U
2-Butanone	U	U
1,1,1-Trichloroethane	U	U
Carbon Tetrachloride	U	U
Vinyl Acetate	U	U
Bromodichloromethane	U	U
1,2-Dichloropropane	U	U
Trans-1,3-Dichloropropene	U	U
Trichloroethene	U	U
Dibromochloromethane	U	U
1,1,2-Trichloroethane	U	U
Benzene	U	U
cis-1,3-Dichloropropene	U	U
2-Chloroethylvinylether	U	U
Bromoform	U	U
4-Methyl-2-Pentanone	U	U
2-Hexanone	U	U
Tetrachloroethene	U	U
1,1,2,2-Tetrachloroethane	U	U
Toluene	U	U
Chlorobenzene	U	U
Ethylbenzene	U	U
Styrene	U	U
Total Xylenes	U	U

U= Below RDL R= Unuseable data

Table 3-8 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

Round 1

COMPOUND	GW-W1	GW-W2	GW-W3A	GW-W3B	GW-W4	GW-W4 D	GW-W5
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	20	28	U
2-Methylphenol	U	U	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U
Benzoic acid	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	22	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U
Anthracene	U	U	U	U	U	U	U
Di-n-butylphthalate	150	100	140	120	100	74	U
Fluoranthene	U	U	U	U	U	U	U
Pyrene	U	U	U	U	U	U	U
Butylbenzylphthalate	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	24	50	30	24	22	16	20
Di-n-octylphthalate	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U
Benzo(a)pyrene	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U

U= Below RDL   R= Unusable data

Table 3-8 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE MDL (UG/L)

Round 1

COMPOUND	GW-W6	GW-W8
Phenol	U	U
bis(2-Chloroethyl)ether	U	U
2-Chlorophenol	U	U
1,3-Dichlorobenzene	U	U
1,4-Dichlorobenzene	U	U
Benzyl alcohol	U	U
1,2-Dichlorobenzene	U	U
2-Methylphenol	U	U
bis(2-Chloroisopropyl)ether	U	U
4-Methylphenol	U	U
N-Nitroso-di-n-dipropylamine	U	U
Hexachloroethane	U	U
Nitrobenzene	U	U
Isophorone	U	U
2-Nitrophenol	U	U
2,4-Dimethylphenol	U	U
Benzoic acid	U	U
bis(2-Chloroethoxy)methane	U	U
2,4-Dichlorophenol	U	U
1,2,4-Trichlorobenzene	U	U
Naphthalene	U	U
4-Chloroaniline	U	U
Hexachlorobutadiene	U	U
4-Chloro-3-methylphenol	U	U
2-Methylnaphthalene	U	U
Hexachlorocyclopentadiene	U	U
2,4,6-Trichlorophenol	U	U
2,4,5-Trichlorophenol	U	U
2-Chloronaphthalene	U	U
2-Nitroaniline	U	U
Dimethylphthalate	U	U
Acenaphthylene	U	U
2,6-Dinitrotoluene	U	U
3-Nitroaniline	U	U
Acenaphthene	U	U
2,4-Dinitrophenol	U	U
4-Nitrophenol	U	U
Dibenzofuran	U	U
2,4-Dinitrotoluene	U	U
Diethylphthalate	U	U
4-Chlorophenyl-phenyl ether	U	U
Fluorene	U	U
4-Nitroaniline	U	U
4,6-Dinitro-2-methylphenol	U	U
N-nitrosodiphenylamine	U	U
4-Bromophenyl-phenylether	U	U
Hexachlorobenzene	U	U
Pentachlorophenol	U	U
Phenanthrene	U	U
Anthracene	U	U
Di-n-butylphthalate	U	130
Fluoranthene	U	U
Pyrene	U	U
Butylbenzylphthalate	U	U
3,3'-Dichlorobenzidine	U	U
Benzo(a)anthracene	U	U
Chrysene	U	U
bis(2-Ethylhexyl)phthalate	R	220
Di-n-octylphthalate	U	U
Benzo(b)fluoranthene	U	U
Benzo(k)fluoranthene	U	U
Benzo(a)pyrene	U	U
Indeno(1,2,3-cd)Pyrene	U	U
Dibenzo(a,h)Anthracene	U	U
Benzo(g,h,i)Perylene	U	U
3-Nitroaniline	U	U

U= Below MDL   R= Unuseable data   WB= Blank sample

Table 3-8 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

Round 2

COMPOUND	GW-W1	GW-W2	GW-W3A	GW-W3A D	GW-W3B	GW-W4	GW-W5
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	26	U
2-Methylphenol	U	U	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U
Benzoic acid	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	22	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U
Anthracene	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U
Fluoranthene	U	U	U	U	U	U	U
Pyrene	U	U	U	U	U	U	U
Butylbenzylphthalate	U	U	U	U	U	U	U
3,3'-Dichorobenzidine	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	U	U	U	U	U	U
Di-n-octylphthalate	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U
Benzo(a)pyrene	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U

U= Below RDL R= Unuseable data

Table 3-8 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

Round 2

COMPOUND	GW-W6
Phenol	U
bis(2-Chloroethyl)ether	U
2-Chlorophenol	U
1,3-Dichlorobenzene	U
1,4-Dichlorobenzene	U
Benzyl alcohol	U
1,2-Dichlorobenzene	U
2-Methylphenol	U
bis(2-Chloroisopropyl)ether	U
4-Methylphenol	U
N-Nitroso-di-n-dipropylamine	U
Hexachloroethane	U
Nitrobenzene	U
Isophorone	U
2-Nitrophenol	U
2,4-Dimethylphenol	U
Benzoic acid	U
bis(2-Chloroethoxy)methane	U
2,4-Dichlorophenol	U
1,2,4-Trichlorobenzene	U
Naphthalene	U
4-Chloroanitine	U
Hexachlorobutadiene	U
4-Chloro-3-methylphenol	U
2-Methylnaphthalene	U
Hexachlorocyclopentadiene	U
2,4,6-Trichlorophenol	U
2,4,5-Trichlorophenol	U
2-Chloronaphthalene	U
2-Nitroaniline	U
Dimethylphthalate	U
Acenaphthylene	U
2,6-Dinitrotoluene	U
3-Nitroaniline	U
Acenaphthene	U
2,4-Dinitrophenol	U
4-Nitrophenol	U
Dibenzofuran	U
2,4-Dinitrotoluene	U
Diethylphthalate	U
4-Chlorophenyl-phenyl ether	U
Fluorene	U
4-Nitroaniline	U
4,6-Dinitro-2-methylphenol	U
N-nitrosodiphenylamine	U
4-Bromophenyl-phenylether	U
Hexachlorobenzene	U
Pentachlorophenol	U
Phenanthrene	U
Anthracene	U
Di-n-butylphthalate	U
Fluoranthene	U
Pyrene	U
Butylbenzylphthalate	U
3,3'-Dichorobenzidine	U
Benzo(a)anthracene	U
Chrysene	U
bis(2-Ethylhexyl)phthalate	U
Di-n-octylphthalate	U
Benzo(b)fluoranthene	U
Benzo(k)fluoranthene	U
Benzo(a)pyrene	U
Indeno(1,2,3-cd)Pyrene	U
Dibenzo(a,h)Anthracene	U
Benzo(g,h,i)Perylene	U
3-Nitroaniline	U

U= Below RDL R= Unuseable data

Table 3-9

AUTO ION SITE
ROUND 1 INORGANIC ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

METAL	GW-W1	GW-W2	GW-W3A	GW-W3B	GW-W4	GW-W4D	GW-W5	GW-W6
Aluminum	U	74600	U	U	U	13800	U	33100
Antimony	R	R	R	R	R	R	R	R
Arsenic	U	31.0	U	U	12.0	33.0	U	47.0
Barium	U	4340.0	U	U	U	U	U	720.0
Beryllium	U	111.0	U	U	U	U	U	6.5
Cadmium	U	39.0	U	U	7.8	6.7	U	23.0
Calcium	156000	961000	304000	149000	230000	352000	228000	960000
Chromium	U	1000.0	U	U	27.0	R	U	1310.0
Cobalt	U	312.0	U	U	U	U	U	76.0
Copper	U	473.0	U	U	R	R	U	644.0
Iron	U	45200	348	U	R	R	U	114000
Lead	U	568.0	U	U	R	R	U	388.0
Cyanide	U	62.0	129.0	13.0	2700.0	2850.0	40.0	11.0
Magnesium	41800	245000	24300	47200	64400	89600	37800	209000
Manganese	16.0	1380.0	1270.0	255.0	R	R	1390.0	11200.0
Mercury	U	1.50	U	U	U	U	U	0.90
Nickel	U	3630.0	270.0	211.0	4810.0	5650.0	2210.0	1350.0
Potassium	5720	11100	20100	U	114000	118000	41200	13400
Selenium	R	R	R	R	R	R	R	R
Silver	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0
Sodium	163000	133000	66800	80300	543000	551000	132000	196000
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	U	U	U	U	U	65.0
Zinc	U	255.0	27.0	32.0	R	R	214.0	700.0
Hexa-Chromium	U	0.00	U	U	U	U	U	U

U= Below RDL R= Unuseable data

Table 3-9 (cont.)

AUTO ION SITE
ROUND 2 INORGANIC ANALYSIS SUMMARY SHEET FOR GROUNDWATER
ALL USEABLE DATA ABOVE RDL (UG/L)

METAL	GW-W1 -2	GW-W2 -2	GW-W3A -2	GW-W3AD-2	GW-W3B -2	GW-W4 -2	GW-W5 -2	GW-W6 -2
Aluminum	38600	71700	5320	7130	U	4680	11000	36600
Antimony	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arsenic	R	11.0	19.0	21.0	R	24.0	44.0	27.0
Barium	384.0	4520.0	U	U	U	U	U	746.0
Beryllium	U	U	U	U	U	U	U	U
Cadmium	13.0	23.0	U	5.3	U	16.0	11.0	16.0
Calcium	427000	488000	328000	335000	153000	473000	361000	498000
Chromium	277.0	599.0	748.0	902.0	19.0	222.0	1370.0	867.0
Cobalt	71.0	125.0	U	U	U	U	U	53.0
Copper	R	R	492.0	606.0	U	R	1150.0	R
Iron	220000	278000	36300	40000	2050	16800	51900	260000
Lead	200.0	230.0	45.0	57.0	8.0	57.0	61.0	240.0
Cyanide	U	U	110.0	130.0	U	50.0	40.0	U
Magnesium	117000	138000	32900	38200	46300	138000	58500	130000
Manganese	5370.0	38200.0	1520.0	1760.0	234.0	1690.0	1980.0	5120.0
Mercury	0.30	U	1.00	1.30	U	U	2.70	0.30
Nickel	225.0	12300.0	1620.0	1770.0	U	11600.0	2450.0	601.0
Potassium	8310	12000	26000	28600	U	92600	28300	13100
Selenium	R	R	R	R	R	R	R	R
Silver	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sodium	140000	106000	66800	77200	74700	298000	120000	153000
Thallium	U	U	U	U	U	U	U	U
Vanadium	108.0	178.0	0.0	0.0	0.0	14.0	21.0	120.0
Zinc	521.0	640.0	1110.0	1280.0	U	4910.0	1090.0	537.0
Hexa-Chromium	U	130.00	U	U	U	U	U	U

U= Below RDL R= Unuseable data

TABLE 3-10 continued

Comparison of Organic Analyses from groundwater sampling.

MONITORING WELL W-4 (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
Vinyl Chloride	40	---
Methylene Chloride	560	---
Trans-1,2-Dichloroethane	180	16
Chloroform	95	19
1,2-Dichloroethane	45	---
Trichloroethene	420	160

MONITORING WELL W-5 (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
Vinyl Chloride	24	---
Methylene Chloride	6	R
Trichloroethene	15	---

MONITORING WELL W-6 (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
	NONE DETECTED	

--- Denotes results are below Required Detection Level

R Denotes unuseable result

TABLE 3-10 continued

Comparison of Organic Analyses from groundwater sampling.

MONITORING WELL W-1 (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
Tetrachloroethene	7	6

MONITORING WELL W-2 (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
Chloroform	6	31
Trichloroethene	5	---

MONITORING WELL W-3A (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
Vinyl Chloride	5	---
Methylene Chloride	11	---
Trans-1,2-Dichloroethane	86	150
Trichloroethane	92	100

MONITORING WELL W-3B (ug/L)

COMPOUND	First Round 11/03/87	Second Round 03/08/88
	NONE DETECTED	

TABLE 3-10 continued

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-6 (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	33100	36600
Antimony	R	---
Arsenic	47	27
Barium	720	746
Beryllium	6.5	---
Cadmium	23	16
Calcium	960000	488000
Chromium	1310	867
Cobalt	76	53
Copper	644	R
Iron	114000	260000
Lead	388	240
Cyanide	11	---
Magnesium	209000	130000
Manganese	11200	5120
Mercury	0.90	0.30
Nickel	1350	601
Potassium	13400	13100
Selenium	R	R
Silver	---	---
Sodium	196000	153000
Thallium	---	---
Vanadium	65	120
Zinc	782	537
Hexavalent Chromium	---	---

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

TABLE 3-10 continued

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-5 (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	---	11000
Antimony	R	---
Arsenic	---	44
Barium	---	---
Beryllium	---	---
Cadmium	---	11
Calcium	228000	361000
Chromium	---	1370
Cobalt	---	---
Copper	---	1150
Iron	---	51900
Lead	---	61
Cyanide	40	40
Magnesium	37800	58500
Manganese	1390	1980
Mercury	---	2.70
Nickel	2210	2450
Potassium	41200	28300
Selenium	R	R
Silver	---	---
Sodium	132000	120000
Thallium	---	---
Vanadium	---	21
Zinc	214	1090
Hexavalent Chromium	---	---

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

TABLE 3-10 continued

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-4 (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	13800	4680
Antimony	R	---
Arsenic	23	24
Barium	---	---
Beryllium	---	---
Cadmium	6.7	16
Calcium	352000	473000
Chromium	R	222
Cobalt	---	---
Copper	R	R
Iron	R	16800
Lead	R	57
Cyanide	2850	50
Magnesium	89600	138000
Manganese	R	1690
Mercury	---	---
Nickel	5650	11600
Potassium	118000	92600
Selenium	R	R
Silver	---	---
Sodium	551000	298000
Thallium	---	---
Vanadium	---	14
Zinc	R	4910
Hexavalent Chromium	---	---

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

TABLE 3-10 continued

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-3A (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	---	7130
Antimony	R	---
Arsenic	---	21
Barium	---	---
Beryllium	---	---
Cadmium	---	5.3
Calcium	304000	335100
Chromium	---	902
Cobalt	---	---
Copper	---	606
Iron	348	40000
Lead	---	57
Cyanide	129	130
Magnesium	24300	28200
Manganese	1270	1760
Mercury	---	1.30
Nickel	270	1770
Potassium	20100	28600
Selenium	R	R
Silver	---	---
Sodium	66800	77200
Thallium	---	---
Vanadium	---	---
Zinc	27	1280
Hexavalent Chromium	---	---

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

TABLE 3-10 continued

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-3B (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	---	---
Antimony	R	---
Arsenic	---	R
Barium	---	---
Beryllium	---	---
Cadmium	---	---
Calcium	149000	153000
Chromium	---	19
Cobalt	---	---
Copper	---	---
Iron	---	2050
Lead	---	8
Cyanide	13	70
Magnesium	47200	46300
Manganese	255	234
Mercury	---	---
Nickel	211	32
Potassium	---	3460
Selenium	R	R
Silver	---	---
Sodium	80300	74700
Thallium	---	---
Vanadium	---	---
Zinc	32	---
Hexavalent Chromium	---	---

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

TABLE 3-10 continued

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-2 (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	74600	71700
Antimony	R	---
Arsenic	31	11
Barium	4340	4520
Beryllium	111	---
Cadmium	39	23
Calcium	961000	488000
Chromium	1000	599
Cobalt	312	125
Copper	473	R
Iron	46200	278000
Lead	568	230
Cyanide	62	---
Magnesium	245000	138000
Manganese	1380	38200
Mercury	1.50	---
Nickel	3630	12300
Potassium	11100	12000
Selenium	R	R
Silver	11	---
Sodium	133000	106000
Thallium	---	---
Vanadium	---	178
Zinc	855	640
Hexavalent Chromium	---	130

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

TABLE 3-10

Comparison of Inorganic Analyses from groundwater sampling.

MONITORING WELL W-1 (ug/L)

CATION	First Round 11/03/87	Second Round 03/08/88
Aluminum	---	38600
Antimony	R	---
Arsenic	---	R
Barium	---	384
Beryllium	---	---
Cadmium	---	13
Calcium	156000	427000
Chromium	---	277
Cobalt	---	71
Copper	---	R
Iron	---	220000
Lead	---	200
Cyanide	---	---
Magnesium	41800	117000
Manganese	16	5370
Mercury	---	0.30
Nickel	---	225
Potassium	5720	8310
Selenium	R	R
Silver	---	---
Sodium	163000	140000
Thallium	---	---
Vanadium	---	108
Zinc	---	521
Hexavalent Chromium	---	---

--- Denotes results are below Required Detection Level

R Denotes Data is unusable

Table 3-11

REQUIRED DETECTION LIMITS (RDL)*
HAZARDOUS SUBSTANCE LIST (HSL) ORGANIC PARAMETERS

	VOLATILES	CAS Number	Detection Limits[1] Low Water[2] ug/l	Detection Limits[1] Low Soil/Sediment[3] ug/kg
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-01-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon Disulfide	75-15-0	5	5
8.	1,1-Dichloroethane	75-35-4	5	5
9.	1,1-Dichloroethane	75-35-3	5	5
10.	trans-1,2-Dichloroethane	156-60-5	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl Acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
19.	1,2-Dichloropropane	78-87-5	5	5
20.	trans-1,3-Dichloropropene	10061-02-6	5	5
21.	Trichloroethane	79-01-6	5	5
22.	Dibromocloromethane	124-48-1	5	5
23.	1,1,2-Trichloroethane	79-00-5	5	5
24.	Benzene	71-43-2	5	5
25.	cis-1,3-Dichloropropene	10061-01-5	5	5
26.	2-Chloroethyl Vinyl Ether	110-75-8	10	10
27.	Bromoform	75-25-2	5	5
28.	2-Hexanone	591-78-6	10	10
29.	4-Methyl-2-pentanone	108-10-1	10	10
30.	Tetrachloroethane	127-18-4	5	5

Table 3-11 (cont.)

REQUIRED DETECTION LIMITS (RDL)*
HAZARDOUS SUBSTANCE LIST (HSL) ORGANIC PARAMETERS

	VOLATILES	CAS Number	Detection Limits[1] Low Water[2] ug/l	Low Soil/Sediment[3] ug/kg
31.	Toluene	108-88-3	5	5
32.	Chlorobenzene	108-90-7	5	5
33.	Ethyl Benzene	100-41-4	5	5
34.	Styrene	100-42-5	5	5
35.	Total Xylenes		5	5
36.	Phenol	108-95-2	10	330
37.	bis(2-Chloroethyl)ether	111-44-4	10	330
38.	2-Chlorophenol	95-57-8	10	330
39.	1,3-Dichlorobenzene	541-73-1	10	330
40.	1,4-Dichlorobenzene	106-46-7	10	330
41.	Benzyl Alcohol	100-51-6	10	330
42.	1,2-Dichlorobenzene	95-50-1	10	330
43.	2-Methylphenol	95-48-7	10	330
44.	bis(2-Chloroisopropyl)ether	39638-32-9	10	330
45.	4-Methylphenol	106-44-5	10	330
46.	N-Nitroso-Dipropylamine	621-64-7	10	330
47.	Hexachloroethane	67-72-1	10	330
48.	Nitrobenzene	98-95-3	10	330
49.	Isophorone	78-59-1	10	330
50.	2-Nitrophenol	88-75-5	10	330
51.	2,4-Dimethylphenol	105-67-9	10	330
52.	Benzoic Acid	65-85-0	50	1600
53.	bis(2-Chloroethoxy)methane	111-91-1	10	330
54.	2,4-Dichlorophenol	120-83-2	10	330
55.	1,2,4-Trichlorobenzene	120-82-1	10	330
56.	Naphthalene	91-20-3	10	330
57.	4-Chloroaniline	106-47-8	10	330
58.	Hexachlorobutadiene	87-68-3	10	330

Table 3-11 (cont.)

REQUIRED DETECTION LIMITS (RDL)*
HAZARDOUS SUBSTANCE LIST (HSL) ORGANIC PARAMETERS

	VOLATILES	CAS Number	Detection Limits[1] Low Water[2] ug/l	Low Soil/Sediment[3] ug/kg
59.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
60.	2-Methylnaphthalene	91-57-6	10	330
61.	Hexachlorocyclopentadiene	77-47-4	10	330
62.	2,4,6-Trichlorophenol	88-06-2	10	330
63.	2,4,5-Trichlorophenol	95-95-4	50	1600
64.	2-Chloronaphthalene	91-58-7	10	330
65.	2-Nitroaniline	88-74-4	50	1600
66.	Dimethyl Phthalate	131-11-3	10	330
67.	Acenaphthylene	208-96-8	10	330
68.	3-Nitroaniline	99-09-2	50	1600
69.	Acenaphthene	83-32-9	10	330
70.	2,4-Dinitrophenol	51-28-5	50	1600
71.	4-Nitrophenol	100-02-7	50	1600
72.	Dibenzofuran	132-64-9	10	330
73.	2,4-Dinitrotoluene	121-14-2	10	330
74.	2,6-Dinitrotoluene	606-20-2	10	330
75.	Diethylphthalate	84-66-2	10	330
76.	4-Chlorophenyl Phenyl ether	7005-72-3	10	330
77.	Fluorene	86-73-7	10	330
78.	4-Nitroaniline	100-01-6	50	1600
79.	4,6-Dinitro-2-methylphenol	534-52-1	50	1600
80.	N-nitrosodiphenylamine	86-30-6	10	330
81.	4-Bromophenyl Phenyl ether	101-55-3	10	330
82.	Hexachlorobenzene	118-74-1	10	330
83.	Pentachlorophenol	87-86-5	50	1600
84.	Phenanthrene	85-01-8	10	330
85.	Anthracene	120-12-7	10	330
86.	Di-n-butylphthalate	84-74-2	10	330
87.	Fluoranthene	206-44-0	10	330

Table 3-11 (cont.)

REQUIRED DETECTION LIMITS (RDL)*
HAZARDOUS SUBSTANCE LIST (HSL) ORGANIC PARAMETERS

	VOLATILES	CAS Number	Detection Limits(1) Low Water(2) ug/l	Detection Limits(1) Low Soil/Sediment(3) ug/kg
88.	Pyrene	129-00-0	10	330
89.	Butyl Benzyl Phthalate	85-68-7	10	330
90.	3,3'-Dichlorobenzidine	91-94-1	20	660
91.	Benzo(a)anthracene	56-55-3	10	330
92.	bis(2-ethylhexyl)phthalate	117-81-7	10	330
93.	Chrysene	218-01-9	10	330
94.	Di-n-octyl Phthalate	117-84-0	10	330
95.	Benzo(b)fluoranthene	205-99-2	10	330
96.	Benzo(k)fluoranthene	207-08-9	10	330
97.	Benzo(a)pyrene	50-32-8	10	330
98.	Indeno(1,2,3-cd)pyrene	193-39-5	10	330
99.	Dibenz(a,h)anthracene	53-70-3	10	330
100.	Benzo(g,h,i)perylene	191-24-2	10	330
101.	alpha-BHC	319-84-6	0.05	8.0
102.	beta-BHC	319-85-7	0.05	8.0
103.	delta-BHC	319-86-8	0.05	8.0
104.	gamma-BHC (Lindane)	58-89-9	0.05	8.0
105.	Heptachlor	76-44-8	0.05	8.0
106.	Aldrin	309-00-2	0.05	8.0
107.	Heptachlor Epoxide	1024-57-3	0.05	8.0
108.	Endosulfan I	959-98-8	0.05	8.0
109.	Dieldrin	60-57-1	0.10	16.0
110.	4,4'-DDE	72-55-9	0.10	16.0
111.	Endrin	72-20-8	0.10	16.0
112.	Endosulfan II	33213-65-9	0.10	16.0
113.	4,4-DDD	72-54-8	0.10	16.0
114.	Endosulfan Sulfate	1031-07-8	0.10	16.0
115.	4,4'-DDT	50-29-3	0.10	16.0
116.	Endrin Ketone	53494-70-5	0.10	16.0
117.	Methoxychlor	72-43-5	0.5	80.0

Table 3-11 (cont.)

REQUIRED DETECTION LIMITS (RDL)*
HAZARDOUS SUBSTANCE LIST (HSL) ORGANIC PARAMETERS

	VOLATILES	CAS Number	Detection Limits(1) Low Water(2) ug/l	Low Soil/Sediment(3) ug/kg
118.	Chlordane	57-74-9	0.5	80.0
119.	Toxaphene	8001-35-2	1.0	160.0
120.	AROCLOR-1016	12674-11-2	0.5	80.0
121.	AROCLOR-1221	11104-28-2	0.5	80.0
122.	AROCLOR-1232	11141-16-5	0.5	80.0
123.	AROCLOR-1242	53469-21-9	0.5	80.0
124.	AROCLOR-1248	12672-29-6	0.5	80.0
125.	AROCLOR-1254	11097-69-1	1.0	160.0
126.	AROCLOR-1260	11096-82-5	1.0	160.0

NOTES

(1) Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

(2) Medium Water Required Detection Limits (RDL) for Volatile Hazardous Substances List (HSL) Compounds are 100 times the individual Low Water RDL.

(3) Medium Soil/Sediment RDL for Volatile HSL Compounds are 100 times the individual Low Soil/Sediment RDL.

(4) Medium Water RDL for Semi-Volatile HSL Compounds are 100 times the individual Low Water RDL.

(5) Medium Soil/Sediment RDL for Semi-Volatile HSL Compounds are 60 times the individual Low Soil/Sediment RDL.

(6) Medium Water RDL for Pesticide HSL Compounds are 100 times the individual Low Water RDL.

(7) Medium Soil/Sediment RDL for Pesticide HSL Compounds are 15 times the individual Low Soil/Sediment RDL.

* Specific detection limits are highly matrix dependent. The detection limit listed herein are provided for guidance and may not always be achievable.

Table 3-11 (cont.)

REQUIRED DETECTION LIMITS
RAS INORGANICS AND MISCELLANEOUS PARAMETERS

RAS Inorganics	Required Detection Level (RDL) (1)(2) (ug/l)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

NOTES

(1) Any analytical method specified in Exhibit D of IFB WA 85-J838/J839 may be utilized as long as the documented instrument or method detection limits meet the RDL requirements. Higher detection levels may <u>only</u> be used in the following circumstance:

> If the sample concentration exceeds two times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the RDL.

(2) These RDLs are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E of IFB WA 84-J091/J092. The detection limits for samples may be considerably higher depending on the sample matrix.

Miscellaneous Parameters	Required Detection Level Water	Required Detection Level Soil and Sediment
Total Dissolved Solids	20 mg/l	NA(3)
Total Suspended Solids	[illegible]-3 mg/l	NA
Hexavalent Chromium	1.0 ug/l	

(3) Not applicable

iron at 46,200 ug/L, lead at 568 ug/L, cyanide at 62 ug/L, magnesium at 245,000 ug/L, manganese at 1,380, mercury at 1.50 ug/L, nickel at 3,630 ug/L, potassium at 11,100, silver at 11 ug/L, sodium at 133,000 and zinc 855 ug/L. The second round of inorganic sample analyses determined aluminum to be present at 71,700 ug/L, arsenic at 11 ug/L, barium at 4,520 ug/L, cadmium at 23 ug/L, calcium at 488,000 ug/L, chromium at 599 ug/L, cobalt at 125 ug/L, iron at 278,000 ug/L, lead at 230 ug/L, magnesium at 138,000 ug/L, manganese at 38,200 ug/L, nickel at 12,300 ug/L, potassium at 12,000 ug/L, sodium at 106,000 ug/L, vanadium at 178 ug/L, zinc at 640 ug/L and hexavalent chromium at 130 ug/L.

Volatiles detected in W-3a consisted of trichloroethene at 92 ug/L, vinyl chloride at 5 ug/L, methylene chloride at 11 ug/L and trans-1,2-dichloroethane at 86 ug/L during the first round of sampling; during the second round trichloroethene was detected at 100 ug/L and trans-1,2-dichloroethane was found at 150 ug/L. The semivolatile analyses resulted in the detection of 2,4,6-trichlorophenol at 22 ug/L in the first round of sampling only. Inorganics detected at W-3a during the first round included calcium at 304,000 ug/L, iron at 348 ug/L, cyanide at 129 ug/L, magnesium at 24,300 ug/L, manganese at 1,270 ug/L, nickel at 270 ug/L, potassium at 20,100 ug/L, sodium 66,800 ug/L and zinc at 27 ug/L. The second round of inorganic analyses resulted in the detection of aluminum at 7,130 ug/L, arsenic at 21 ug/L, cadmium at 5.3 ug/L, calcium at 335,000 ug/L, chromium at 902 ug/L, copper at 606 ug/L, iron at 40,000 ug/L, lead at 57 ug/L, cyanide at 130 ug/L, magnesium at 38,200 ug/L, manganese at 1,760 ug/L, mercury at 1.30 ug/L, nickel at 1,770 ug/L, potassium at 28,600 ug/L, sodium at 77,200 ug/L and zinc at 1,280 ug/L.

All organic compounds detected in W-3b were also detected in the field blank. Inorganics found in the first round samples at W-3b included calcium at 149,000 ug/L, cyanide at 13 ug/L, magnesium at 47,200 ug/L, manganese at 255 ug/L, nickel at 211 ug/L, sodium at 80,300 ug/L and zinc at 32.0 ug/L. The second round of samples resulted in the detection of 153,000 ug/L of calcium, 19 ug/L chromium, 2,050 ug/L iron, 8 ug/L lead, 70 ug/L cyanide, 46,300 ug/L magnesium, 234 ug/L manganese, 32 ug/L nickel, 3,460 ug/L potassium and 74,700 ug/L sodium.

Volatile organics detected at W-4 in the first round of sampling included vinyl chloride at 40 ug/L, methylene chloride at 560 ug/L, trans-1,2-dichloroethane at 180 ug/L, chloroform at 95 ug/L, 1,2-dichloroethane at 45 ug/L and trichloroethene at 420 ug/L. The second round of sample analyses also detected trans-1,2-dichloroethane at 16 ug/L, chloroform at 19 ug/L, and trichloroethene at 160 ug/L. The semivolatile compound, 1,2-dichlorobenzene, was detected in both the first and second sample rounds at 28 ug/L and 26 ug/L, respectively. The first round analyses for inorganics yielded the detection of aluminum at 13,800 ug/L, arsenic at 33 ug/L, calcium at 352,000 ug/L, cyanide at 2,850 ug/L, magnesium at 89,600 ug/L, nickel at 5,650 ug/L, potassium at 118,000 ug/L, and sodium at 551,000 ug/L. The second round of inorganic sampling resulted in the detection of aluminum at 4,680 ug/L, arsenic at 24 ug/L, cadmium at 16 ug/L, 473,000 ug/L, chromium at 222 ug/L, iron at 16,800 ug/L, lead at 57 ug/L, cyanide at 50 ug/L, magnesium at 138,000 ug/L, manganese at 1,690 ug/L, nickel at 11,600 ug/L, potassium at 92,600 ug/L, sodium at 298,000 ug/L, vanadium at 14 ug/L, and zinc at 4,910 ug/L.

W-5 contained 24.0 ug/L of vinyl chloride, 6 ug/L of methylene chloride and 15 ug/L of trichloroethene in the first round of analyses for volatile organics. Inorganics detected in the first round of W-5 sampling included calcium at 228,000 ug/L, cyanide at 40 ug/L, magnesium at 37,800 ug/L, manganese at 1,390 ug/L, nickel at 2,210 ug/L, potassium at 41,200 ug/L, sodium at 132,000 ug/L and zinc at 214 ug/L. The second round of inorganic sampling analyses for W-5 yielded aluminum at 11,000 ug/L, arsenic at 44 ug/L, cadmium at 11 ug/L, calcium at 361,000 ug/L, chromium at 1,370 ug/L, copper at 1,150 ug/L, iron at 51,900 ug/L, lead at 61 ug/L, cyanide at 40 ug/L, magnesium at 58,500 ug/L, manganese at 1,980 ug/L, mercury at 2.70 ug/L, nickel at 2,450 ug/L, potassium at 28,300 ug/L, sodium at 120,000 ug/L, vanadium at 21 ug/L and zinc at 1,090 ug/L.

No volatiles were detected in W-6 with the exception of those also detected in the field blank at approximately the same concentration. Inorganics detected during the first sampling round included aluminum at 33,100 ug/L, arsenic at 47 ug/L, barium at 720 ug/L, beryllium at 6.5 ug/L, cadmium at 23 ug/L, calcium at 960,000 ug/L, chromium at 1,310 ug/L, cobalt at 76.0 ug/L, copper at 644.0 ug/L, iron at 114,000 ug/L, lead at 388 ug/L, cyanide at 11.0 ug/L, magnesium at 209,000 ug/L, manganese at 11,200 ug/L, mercury at 0.90 ug/L, nickel at 1,350 ug/L, potassium at 13,400 ug/L, sodium at 196,000 ug/L, vanadium at 65 ug/L and zinc at 782.0 ug/L respectively. The second round of inorganic analyses yielded 36,600 ug/L of aluminum, 27 ug/L arsenic, 746 ug/L barium, 16 ug/L cadmium, 488,000 ug/L calcium, 867 ug/L chromium, 53 ug/L cobalt, 260,000 ug/L iron, 240 ug/L lead, 130,000 ug/L magnesium, 5,120 ug/L manganese, 0.30 ug/L mercury, 601 ug/L nickel, 13,100 ug/L potassium, 153,000 ug/L sodium, 120 ug/L vanadium and 537 ug/L zinc.

3.5 Casing Elevation Survey and Water Level Measurements

3.5.1 Purpose. Following completion of the monitoring well installation, the mean sea level (MSL) elevations of the protective steel casing and stainless steel riser piper were surveyed. The wells, staff gauge, borings and other pertinent features were located. This data, in conjunction with the water level measurements enabled HART personnel to contour the potentiometric surface and determine groundwater flow direction.

3.5.2 Methodology

3.5.2.1 Well Elevation Survey. Elevations were determined by utilizing differential leveling techniques. The elevations were surveyed from Bench Mark 0153 (supplied by the City of Kalamazoo), to an accuracy of 0.01 feet using a Wild NA24 Auto Level. To insure consistency of measurements, elevations were shot to the northern side of the outer protective casing and inner riser pipes.

3.5.2.2 Water Level Measurements. Water level measurements at all wells and staff gauge were made with the use of a hand held electronic water level indicator manufactured by the Slope Indicator Company. The instrument probe was lowered from the top of the protective casing down the well. When the probe came in contact with the water, an audio signal was emitted and the distance to the top of the protective casing was measured.

3.5.2.3 Well Location and Topographic Survey. The monitoring wells, soil borings and other pertinent features were located using a Sokkisha BT 20 Transit and a 100' steel tape. Ground elevations were surveyed using a Wild NA24 Auto Level to an accuracy of 0.1 feet while manhole casing elevations were surveyed to an accuracy of 0.01 feet in order to determine storm and sanitary sewer flow directions.

3.5.2.4 Findings. Results of the survey and the five rounds of groundwater level measurements can be found in Table 3-12. The resultant potentiometric surface can be found in Figures 3-C through 3-G. Well and borehole locations as well as the topography at the Auto Ion Site is depicted on the Site maps included as Appendix I. Water level measurements indicate the potentiometric surface has changed shape and direction several times throughout the monitoring process, and may be a function of river level in the adjacent Kalamazoo River. The change in direction of groundwater flow could result in substantial deviations in the groundwater analytical data generated during one sampling event when compared to the data generated during subsequent sampling events at different times.

3.6 Permeability Testing

3.6.1 Purpose. Hydraulic conductivity (K) is the volume of water that will flow through a unit cross - sectional area in a unit time under a unit a hydraulic gradient and at a standard temperature. In order to determine the average hydraulic conductivity values of underlying geologic formations, HART conducted aquifer tests at the Auto Ion Site. Aquifer tests were performed on a total of six monitoring wells. All of the wells had two inch diameters and screen lengths of 10.7 feet. The wells were all screened in unconsolidated material.

3.6.2 Methodology. A single borehole permeability test, known as the Slug Test, was implemented at the aforementioned Site. Initially, using an electronic water level indicator, the static water level (H) in each well was measured and recorded. Two methods were used to generate slug test data. The first method involved lowering a decontaminated aluminum

TABLE 3-12

WELL DATA
AUTO ION

WELL NO.	GROUND LEVEL	ELEVATIONS IN FEET MSL PROTECTIVE CASING	TOP OF RISER	BOTTOM ELEVATION	ELEVATION OF SCREENED INTERVAL	WATER LEVELS 11/3/87	01/08/88	02/21/88	03/07/88	3/25/88
W-1	761.46	764.30	764.10	742.46	755.46 TO 744.76	753.87	754.99	755.52	755.22	754.95
W-2	762.66	765.35	765.13	745.56	756.26 TO 745.56	753.99	754.59	755.53	755.09	754.84
W-3a	762.63	764.60	764.38	745.63	756.33 TO 745.63	752.49	754.55	755.51	754.99	754.81
W-3b	762.51	764.65	764.36	712.01	727.41 TO 716.71	752.46	754.45	755.62	754.88	754.82
W-4	764.11	765.71	765.43	740.11	751.81 TO 741.11	752.66	754.39	755.62	754.86	754.79
W	763.36	765.77	765.55	739.36	750.86 TO 740.16	752.86	754.33	755.65	754.83	754.77
W-6	764.06	766.19	765.94	740.06	751.26 TO 741.06	753.67	754.32	755.79	754.79	754.73
STAFF GAUGE		757.22				754.24	753.82	756.28		754.62

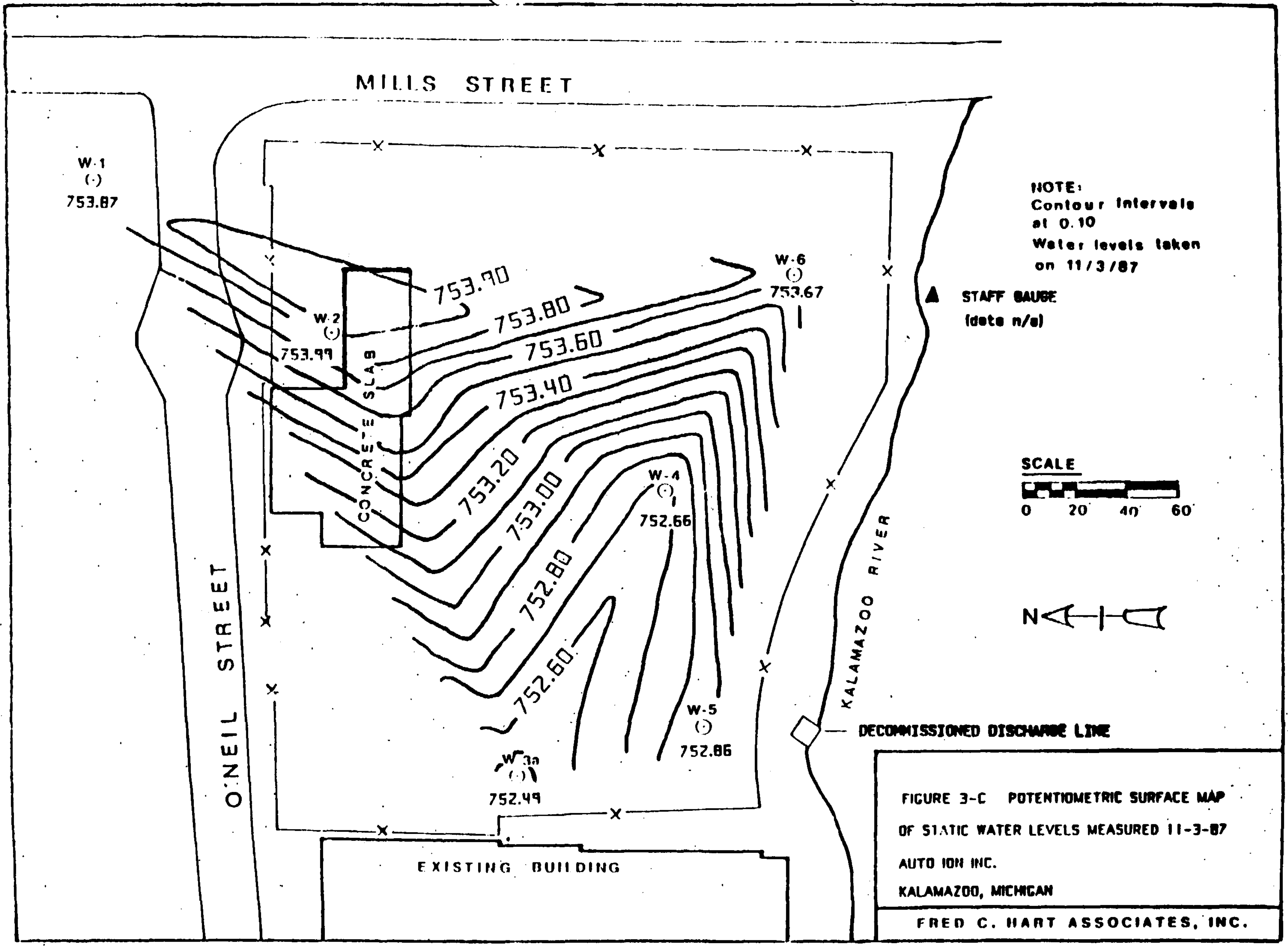


FIGURE 3-C POTENTIOMETRIC SURFACE MAP OF STATIC WATER LEVELS MEASURED 11-3-87
AUTO ION INC.
KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

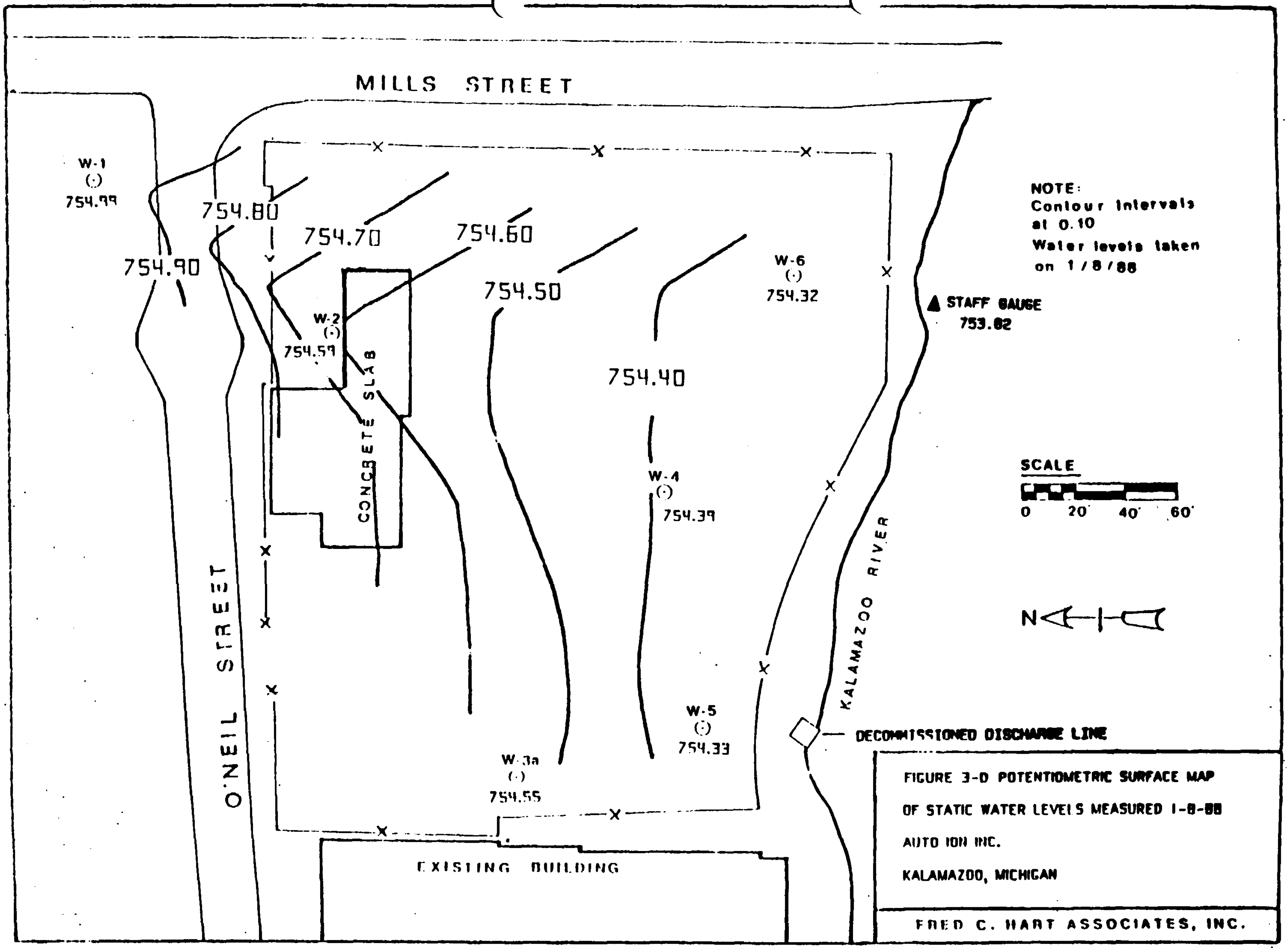


FIGURE 3-D POTENTIOMETRIC SURFACE MAP OF STATIC WATER LEVELS MEASURED 1-8-88

AUTO ION INC.

KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

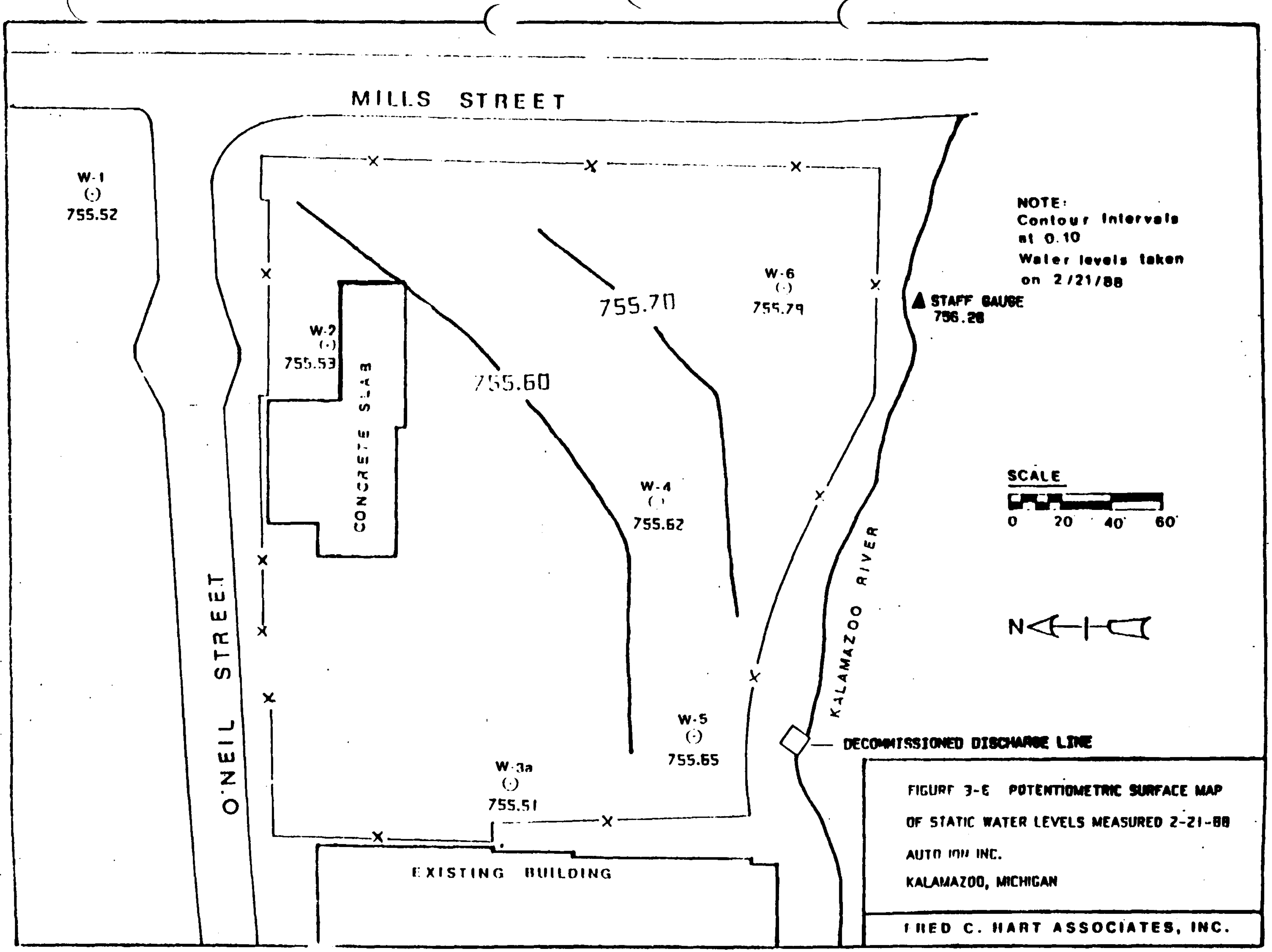


FIGURE 3-E POTENTIOMETRIC SURFACE MAP OF STATIC WATER LEVELS MEASURED 2-21-88
AUTO ION INC.
KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

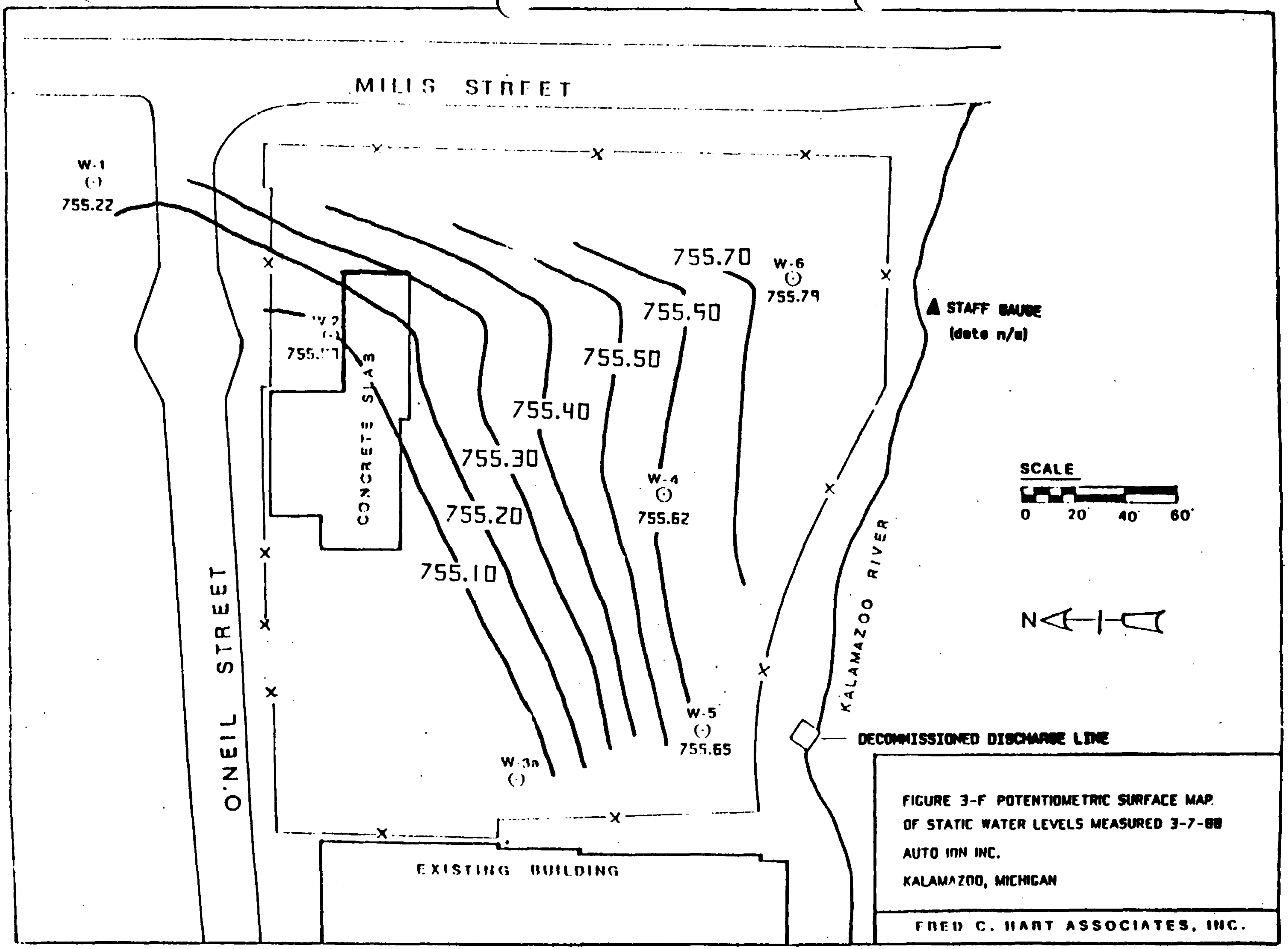


FIGURE 3-F POTENTIOMETRIC SURFACE MAP OF STATIC WATER LEVELS MEASURED 3-7-88

AUTO ION INC.

KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

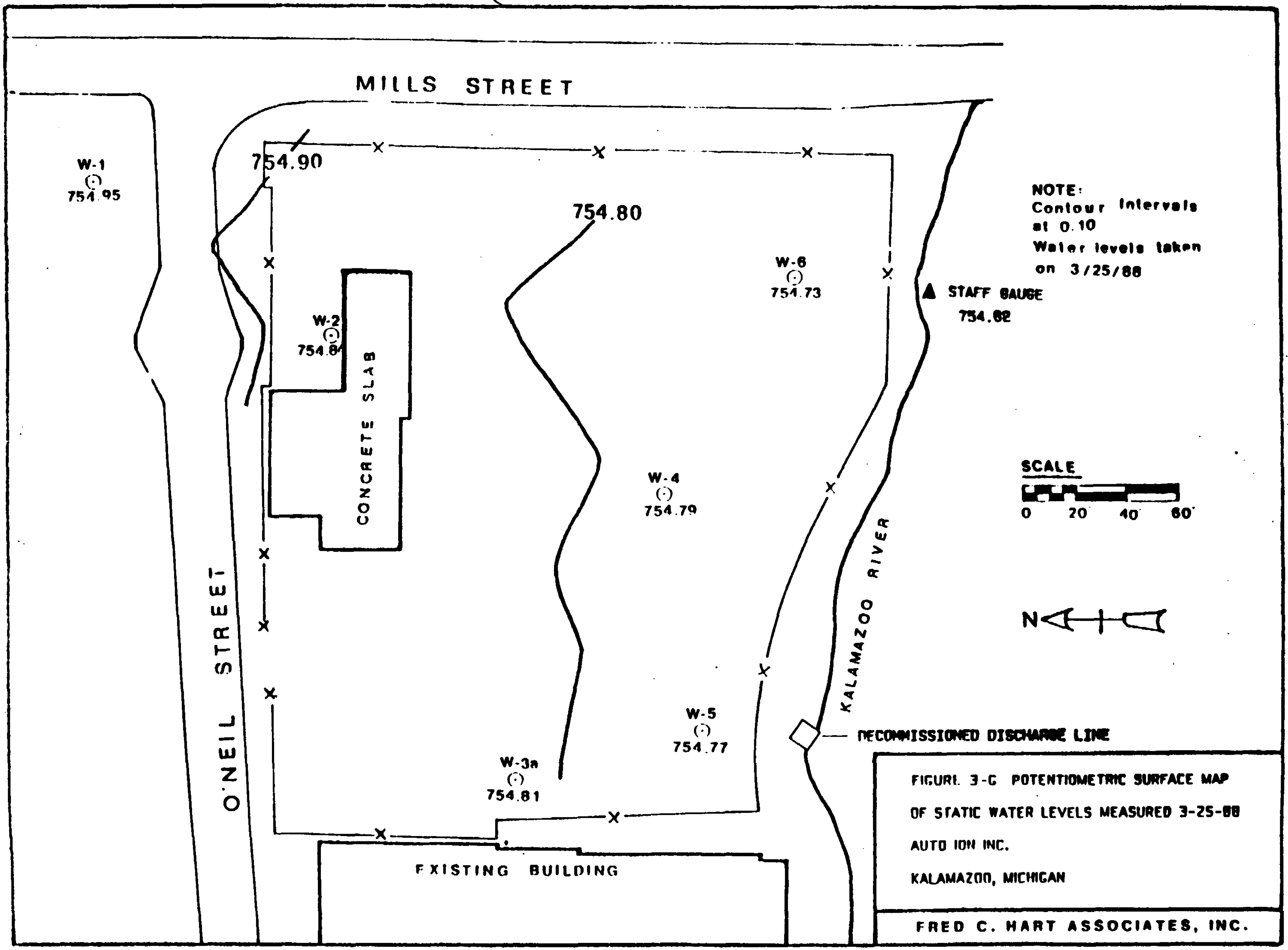


FIGURE 3-C POTENTIOMETRIC SURFACE MAP OF STATIC WATER LEVELS MEASURED 3-25-88
AUTO ION INC.
KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

slug into the well displacing a known volume of water. The test was initiated at the instant the slug was emplaced. Water levels were monitored with time until equilibrium conditions had been established. The second method involved removing the emplaced slug and monitoring the water levels after removing the volume that the slug had displaced from the well. Therefore, the slug, which displaces a known volume of water, was either instantaneously installed in the well, or instantaneously removed from the well. Afterward, either the rate of recharge or the rate of recovery from the well was measured at frequent time intervals, using an electronic water level indicator, until equilibrium was reached. The measurements and their respective times were recorded for further calculations.

To begin the test a water level monitoring probe was installed in the well and then set to zero for initial conditions. The slug was either introduced or removed from the well depending on which test was being conducted and measurements of water level change, H_{meas}, with time were initiated. Because there is a slight time-lag between the instant the slug is introduced or removed in the well and the first measurement, time zero, t_o, is assigned to the time of maximum water level differential, H_{max}. Using these measurements and t_o, the ratio of H_{meas}/H_{max} was determined for each recorded measurement.

These values were plotted on 5 cycle semi-logarithmic paper with respect to their specific time interval (t) in minutes. Calculations and the plotted graphs are provided in Appendix VI.

Data reduction for the monitoring wells followed methods set forth by Hvorslev et al. (1951). After the values for H_{meas}/H_{max} were plotted with respect to their specific time interval (t) in minutes, the value of T_o (basic time lag) is measured graphically where the slope of the plotted line intersects the H_{meas}/H_{max} value of 0.37. The expression for hydraulic conductivity (K) from Hvorslev (1951) is:

$$K = \frac{r^2 \ln (L/R)}{2 LT_o}$$

where:

K = hydraulic conductivity (cm/sec)

r = radius of casing (cm)

L = length of piezometer intake (cm)

R = radius of piezometer intake (cm)

T_o = basic time lag (sec)

3.6.3 Findings. The specific values and calculated hydraulic conductivities for the six wells can be found in Table 3-13, the actual field data is found in Appendix VI. Note that the hydraulic conductivity values (K) which were determined describe only the hydraulic conductivity of the material close to each well (Cooper, et al., 1967).

The slug in test for W-3a rendered data that was unusable for determining K and was therefore discarded. The slug in and slug out test for the individual well that remained gave comparable values of K. All of the wells, excluding W-3b are screened at a depth of approximately 10-20 feet, with W-3b screened deeper at 35-45 feet. The mean hydraulic conductivity for all wells was 3×10^{-2} cm/sec. The greatest deviation from this mean value occurred at W-6 where K values were increased to 9.4×10^{-2} cm/sec. W-4 showed the lowest K value of 1.1×10^{-3} cm/sec.

There are a number of general assumptions on which this type of aquifer test is based, such that:

* the well is of finite diameter;
* the well is non-flowing;
* the well is cased to the top of a homogeneous isotropic aquifer of uniform thickness; and
* the well is fully developed and penetrates throughout the thickness of the aquifer.

Few wells completely penetrate an aquifer. However, useful information is derived from a test on a partially penetrating well. Since the vertical permeabilities of most stratified aquifers are only small

TABLE 3-13

SPECIFIC VALUES AND HYDRAULIC CONDUCTIVITIES OF MONITORING WELLS

"I" or "O" Denotes Slug in or Out

Well	T_o (min)	T_o (sec)	casing (cm)	L_{screen} (cm)	R_{intake} (cm)	K(cm/sec)	$K_{ave.}$ (cm/sec)
W-1I	4.4×10^{-2}	2.64	2.54	323.09	2.54	1.83×10^{-3}	6.25^{-3}
W-1O	7.2×10^{-2}	4.32	2.54	323.09	2.54	1.12×10^{-2}	
W-2I	4.4×10^{-2}	2.64	2.54	326.14	2.54	1.82×10^{-2}	1.73^{-2}
W-2O	4.9×10^{-2}	2.94	2.54	326.14	2.54	1.63×10^{-2}	
W-3aI	------	-----	2.54	326.14	2.54	--------	
W-3aO	1.9×10^{-2}	1.14	2.54	326.14	2.54	4.21×10^{-2}	
W-3bI	3.3×10^{-2}	1.98	2.54	326.14	2.54	2.43×10^{-2}	2.19^{-2}
W-3bO	4.1×10^{-2}	2.46	2.54	326.14	2.54	1.95×10^{-2}	
MW-6O	8.5×10^{-3}	0.51	2.54	326.14	2.54	9.42×10^{-2}	
W-4I	7.2×10^{-1}	43.20	2.54	326.14	2.54	1.11×10^{-3}	1.1^{-3}
W-4O	7.4×10^{-1}	44.40	2.54	326.14	2.54	1.08×10^{-3}	

Monitor well #5 slug test data lost during data recovery from data logger.

fractions of the horizontal permeabilities, the direction of flow during the slug test is essentially two-dimensional (Cooper, et al., 1967).

3.7 Surface Water and Sediment Sampling

3.7.1 Purpose. The 1971 investigation of the Auto Ion Chemical Company by the Michigan Department of Natural Resources had indicated elevated concentrations of chromium, nickel, copper, cyanide and oil in sediments of the Kalamazoo River near the facility. In 1987 and 1988, surface water and sediment samples were collected in the Kalamazoo River to determine whether residual chemical concentrations were present and if present, to define the nature and extent of the contamination within the vicinity of the Site. In conjunction with the sampling, a review of agency records was conducted to identify any NPDES permit holders past or present within 1/2 mile upstream and 1 mile downstream of the Site.

All surface water and sediment sampling locations are depicted in Figures 3-H and 3-I and listed in Tables 3-14 and 3-18. Transect A was located east of the Mill Street Bridge upstream from the Auto Ion Site and represented background or control samples. Transects B, C, and D were located within the Auto Ion Site near prior river water intakes and waste outfalls, and E and F were located 1/2 and 1 mile downstream from the Site.

3.7.2 Methodology. Six transects (A-F) of the river were sampled to incorporate data upstream from the Site (Figure 3-I and Table 3-18), within the Site, and 2 locations 1/2 and 1 mile respectively, downstream from the Site (Figure 3-H). Each transect consisted of 4 sampling points, set at evenly spaced intervals across the transect. The original work plan had called for 10 foot intervals between stations but field reconnaissance established that greater spacing would be required to adequately sample the entire transect. A rope was stretched tautly from the north and south river banks and marked in 10 foot increments to facilitate recording the location of each sampling point. One sediment sample was taken at each sampling station. In addition, a surface water sample was taken prior to sediment sampling at sampling stations D-1, D-4, A-1, and A-4. Ph, conductivity and temperature were recorded at each water sampling location

FIGURE 3-H SEDIMENT SAMPLE LOCATIONS

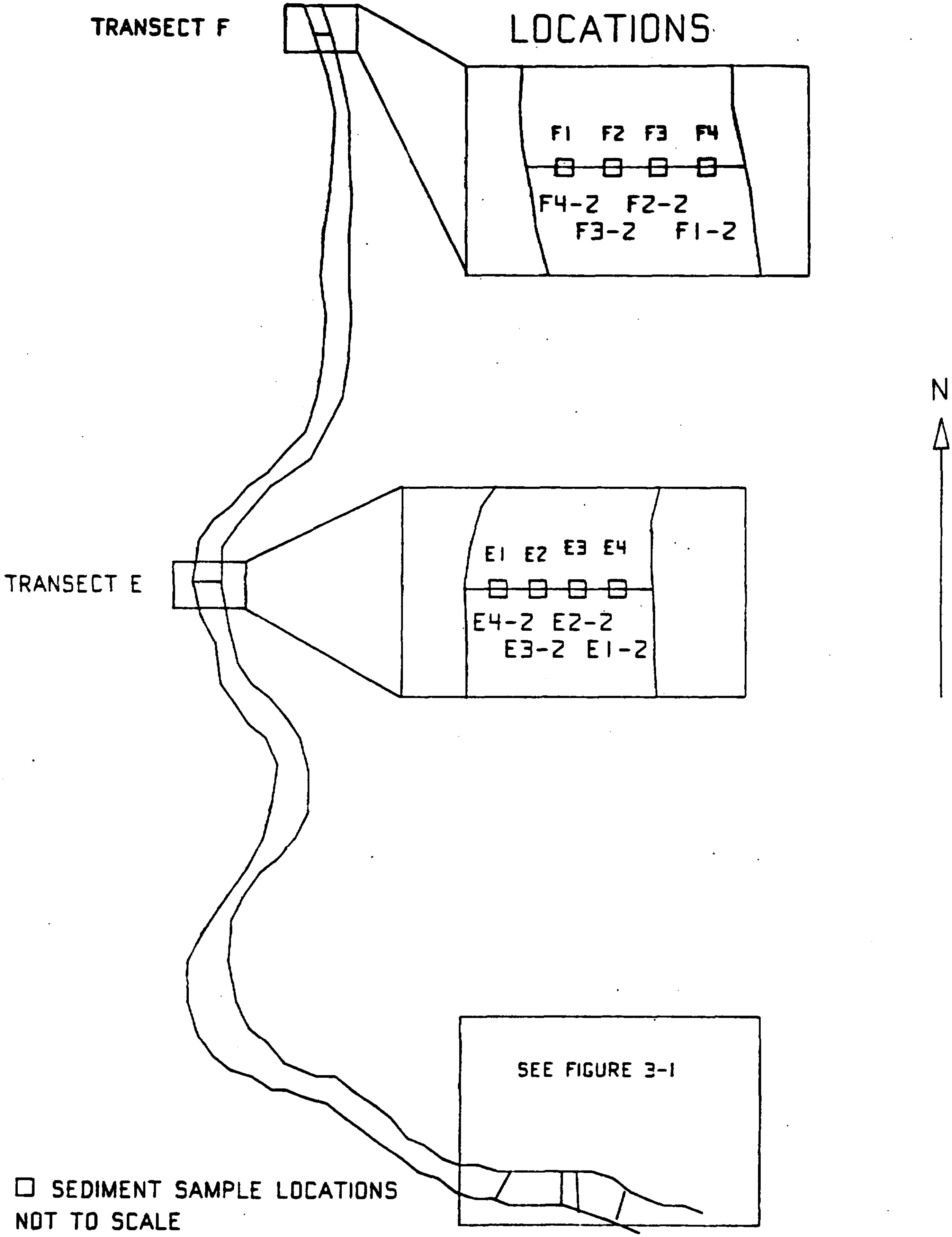
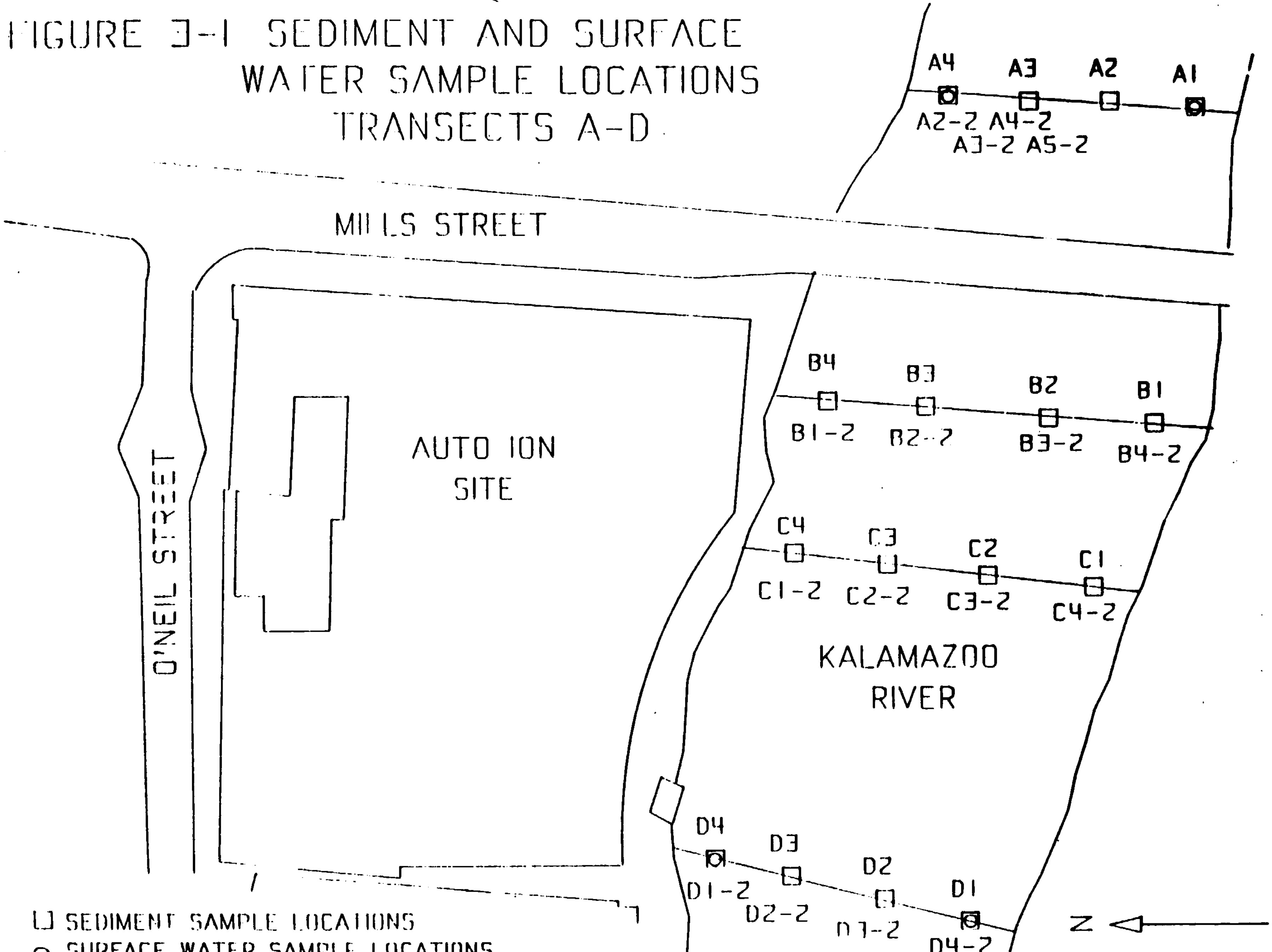


FIGURE 3-1 SEDIMENT AND SURFACE WATER SAMPLE LOCATIONS TRANSECTS A-D



□ SEDIMENT SAMPLE LOCATIONS
○ SURFACE WATER SAMPLE LOCATIONS
NOT TO SCALE

TABLE 3-14

AUTO ION
SURFACE WATER SAMPLES

Sample	Date Sampled	pH	Water Temperature °C	Air Temperature °C	Specific Conductivity Mmhos/cm
SW-A1	10/87	7.4	11	8	700
SW-A4	10/87	7.7	10	8	700
SW-D1	10/87	7.4	10	8	680
SW-D4	10/87	7.4	10	8	700

TABLE 3-15

AUTO ION

SUMMARY OF ORGANIC CONCENTRATIONS ABOVE CRDL IN ug/L

SURFACE WATER SAMPLES

	A1	A4	A4D	D1	D2
Volatile Organics					
Acetone	-	-	-	44	20
Base Neutrals					
Bis (2-ethylhexyl) phthalate	420	300	96	94	140

- below CRDL

Table 3-16

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR SURFACE WATER
ALL USEABLE DATA ABOVE CRDL (UG/L)

COMPOUND	SW-A-1	SW-A-2	SW-A-4D	SW-D-1	SW-D-4
Phenol	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U
2-Methylphenol	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U
4-Methylphenol	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U
Hexachloroethane	U	U	U	U	U
Nitrobenzene	U	U	U	U	U
Isophorone	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U
Benzoic acid	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U
Naphthalene	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U
Acenaphthylene	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U
Acenaphthene	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U
Dibenzofuran	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U
Diethylphthalate	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U
Fluorene	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U
Phenanthrene	U	U	U	U	U
Anthracene	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U
Fluoranthene	U	U	U	U	U
Pyrene	U	U	U	U	U
Butylbenzylphthalate	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	U
Chrysene	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	42[illegible]	30[illegible]	9[illegible]	94	14[illegible]
Di-n-octylphthalate	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U
Benzo(a)pyrene	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U
Dibenz(a,h)Anthracene	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U

U= Below CRDL   R= Unuseable data

Table 3-17

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SURFACE WATER
ALL USEABLE DATA ABOVE CRDL (UG/L)

METAL	SW-D-1	SW-D-4	SW-A-4	SW-A-4D	SW-A-1
Aluminum	219	207	U	U	U
Antimony	U	U	U	U	U
Arsenic	U	U	U	U	U
Barium	U	U	U	U	U
Beryllium	U	U	U	U	U
Cadmium	13.0	12.0	U	U	U
Calcium	76800	77000	73900	72600	74000
Chromium	39.0	37.0	U	U	7.0
Cobalt	U	U	U	U	U
Copper	32.0	32.0	U	U	U
Iron	527	392	363	291	463
Lead	193.0	199.0	U	U	U
Cyanide	R	R	R	R	R
Magnesium	22200	22300	22200	21800	22200
Manganese	58.0	48.0	43.0	37.0	49.0
Mercury	U	U	U	U	U
Nickel	60.0	61.0	U	U	U
Potassium	U	U	U	U	U
Selenium	U	U	U	U	U
Silver	27.0	28.0	0.0	0.0	0.0
Sodium	15900	15700	17200	16800	17100
Thallium	U	U	U	U	U
Vanadium	U	U	U	U	U
Zinc	26.0	U	U	27.0	13.0
Hexa-Chromium	U	U	U	U	U

U= Below CRDL   R= Unuseable data

TABLE 3-18

AUTO ION
SEDIMENT SAMPLES

Sample	Date Sampled	Depth in Feet	Feet From North Shore	Sample Description
SD-A1	10/08/87	9.0		f-m sand with silt
SD-A1-2	03/88		10	m-c gravel; one snail
SD-A2	10/87	8.0		f-m gray sand with silt
SD-A2-2	03/88		30	with coarse gravel size material resembling railroad slag, well rounded snail shells 5mm-25mm long
SD-A3	10/87	9.0		f-m sand with silt little fine gravel, one snail
SD-A3-2	03/88		40	m-c gravel and some sand
SD-A4	10/87	9.0		f-m sand with some silt
SD-A4-2	03/88		50	m-c gravel some sand snail and clam shells
SD-A5-2	03/88		60	m-c gravel with some sand
SD-B1	03/88	4.0		coarse sand some gravel snail, clam
SD-B1-2			30	gravel, silt, shells, snail
SD-B2	10/87	5.0		gravel with f-c sand, clams
SB-B2-2	03/88			black silt, gravel sand
SD-B3	10/87	5.0		m-c gravel f-m sand and S.H
SD-B3-2	03/88			sand, gravel clam shell clam shell
SD-B4	10/87	4.5		m-c rounded gravel with
SD-B4-2	03/88			f-m sand and silt
SD-C1	10/87			coarse gravel
SD C1-2	03/88		15	sand, rounded gravel
SD-C2	10/87	5.0		coarse rounded gravel
SD-C2-2			50	fresh water clams gravel small shell and worms
SD-C3	10/87	6.5		coarse gravel and sand
SD-C3-2	03/88		90	sand, gravel, shells clam shell

Absent data not collected.

TABLE 3-18 (CONTINUED)

AUTO ION
SEDIMENT SAMPLES

Sample	Date Sampled	Depth in Feet	Feet From North Shore	Sample Description
SD-C4	10/87	5.0		coarse sand and gravel
SD-C4-2	03/88			sand and gravel 7"
SD-D1	10/87	7.0		coarse sand and gravel
SD-D1-2	03/88		3	with organic silty muck
SD-D2	10/87	7.0		coarse gravel, fine sand
SD-D2-2	03/88		60	sand, gravel, live clam
SD-D3	10/87	5.0		gravel, some coarse sand
SD-D3-2	03/88		100	sand, gravel, live clam
SD-D4	10/87	5.5		m-c sand with some gravel
SD-D4-2	03/88			sand and gravel
SD-E1	10/87	6.5		not recoverable, gravel only
SD-E1-2	03/88		30	gravel with some sand
SD-E2	10/87	2.5		sand and gravel
SD-E2-2	03/88		60	sand and gravel
SD-E3	10/87	1.5	45	sand and gravel, snail
SD-E3-2	03/88		90	sand and gravel
SD-E4	10/87	2.0	15	sand silt and gravel, snails
SD-E4-2	03/88		120	gravel, clam shell
SD-F1	10/87	8.0	20	leaves, muck,
SD-F1-2	03/88		30	fine sand to greenish silt
SD-F2	10/87	11.0	40	f-c sand
SD-F2-2	03/88		50	organic material, sand gravel, snails
SD-F3	10/87	90.0	60	silty sand and gravel, clams
SD-F3-2	03/88		75	well sorted sand
SD-F4	10/87		80	leaves
SD-F4-2	03/88		100	leaves, large clam shell

* Samples were collected in two rounds of sampling. Inorganics, volatiles, and semi volatiles were sampled for in 10/87. PCBs and pesticides were sampled for in 03/88.

Absent data not collect.

(Table 3-14). Sediment sampling was done in two stages. Analyses for inorganics (metals and cyanide), volatiles and semivolatiles were done on surface water and sediment samples taken in October of 1987. Sediments were re-sampled in March of 1988 for PCB's and pesticides.

The following sampling procedures were followed for each sediment sample. A two man boat was pulled to the sampling station. A Ponar Grab Sampler was lowered to the river bottom, sample was scooped and returned to the surface where it was deposited directly into a clean stainless steel bowl. This was then stirred with a clean stainless steel trowel to homogenize the sample. Sampling continued until enough sediment had been obtained. The boat was then returned to the bank where the sample was placed in sample containers using the trowel.

The sampler, trowel, and bowl were decontaminated after each sampling event to prevent cross contamination between sampling stations. Decontamination procedures consisted of a wash in alconox detergent, rinsing with distilled water, spraying with methanol and a final rinse with distilled water. Surface water samples were collected prior to sediment sampling at four stations by directly immersing the sampling container in the upper one foot of the river.

All samples were collected, as per EPA protocols, in laboratory cleaned sample bottles provided by Century Laboratory and stored on ice immediately after sample collection. Chain of Custody documentation procedures were used to insure accurate identification of samples and tracking of their status, in the field, during shipment, and at the laboratory. Laboratory analyses included inorganics, volatiles, semivolatiles and PCB's and pesticides.

3.7.3 <u>Findings</u>

3.7.3.1 Surface Water. A summary of the analytical parameters above required detection limits (RDL) can be found in Tables 3-15 through 3-17. Analyses included metals, cyanide, volatiles and base neutrals. Only compounds in the following summary. Data sheets, case narratives and a QA/QC review of the data for surface water samples are contained in Appendix V.

Surface water temperatures ranged from 10 to 11 degrees centigrade, pH ranged from 7.4 to 7.7 and conductivities ranged from 680 to 700 umhos/cm. The pH of 7.7 came from Station 4 on transect A (upstream background samples) while the one lower conductivity (680 umhos/cm) came from station 1 on transect D.

In the organic fraction of the analyses, only one compound exceeded detection limits. Bis(2-ethylhexyl)phthalate was detected in all surface water samples and ranged in value from 94 to 420 ug/l, with higher values occurring along the A transect.

In the inorganic analyses of surface water samples, metals which exceeded the CRDL were aluminum, cadmium, lead, nickel, silver, chromium, copper, iron, calcium, magnesium, manganese, sodium and zinc. Concentrations of calcium, magnesium, manganese, iron, and sodium indicate values typically found in naturally occurring surface water and are similar to background samples taken along the A-transect. Chromium, cadmium, copper, lead, silver and zinc concentrations on transect D exceed A transect background values. Aluminum ranged from 219 to 207 ug/L in D1 and D4, respectively. Hexavalent chromium was not detected in any of the surface water samples.

3.7.3.2 Sediments. Field descriptions of the sediment samples collected at each station are listed in Table 3-18. Sediments ranged in grain size from gravel to sand and silt with abundant organic matter present in a few of the samples, and fresh water invertebrates in many of the samples. Organic, inorganic, and pesticide/PCB analytical results for the sediment samples are summarized in Table 3-19, 3-20, 3-21 and Figures 3-J through 3-M.

 Table 3-19

AUTO ION SITE
ORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (UG/KG)

COMPOUND	SD-A1	SD-A2	SD-A3	SD-A4	SD-B1	SD-B1 D	SD-B2
Chloromethane	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	R	U
Methylene Chloride	R	R	R	R	R	U	R
Acetone	R	R	68	R	R	U	R
Carbon Disulfide	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Trans-1,2-Dichloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
2-Butanone	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
2-Chloroethylvinylether	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Total Xylenes	U	U	U	U	U	U	U

U= Below CRDL R= Unuseable data

 Table 3-19 (cont.)

AUTO ION SITE
ORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (UG/KG)

COMPOUND	SD-E3	SD-B4	SD-C1	SD-C2	SD-C3	SD-C4	SD-D1
Chloromethane	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Methylene Chloride	R	R	R	R	R	R	R
Acetone	R	R	R	R	R	U	R
Carbon Disulfide	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Trans-1,2-Dichloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
2-Butanone	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
2-Chloroethylvinylether	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Total Xylenes	U	U	U	U	U	U	U

U= Below CRDL   R= Unuseable data

Table 3-19 (cont.)

AUTO ION SITE
ORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (UG/KG)

COMPOUND	SD-D2	SD-D3	SD-D4	SD-E2	SD-E3	SD-E4	SD-F1
Chloromethane	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Vinyl Chloride	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Methylene Chloride	R	R	R	U	R	U	U
Acetone	R	R	R	U	U	R	U
Carbon Disulfide	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Trans-1,2-Dichloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
2-Butanone	13	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon Tetrachloride	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
2-Chloroethylvinylether	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
4-Methyl-2-Pentanone	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Total Xylenes	U	U	U	U	U	U	U

U= Below CRDL   R= Unuseable data

Table 3-19 (cont.)

AUTO ION SITE
ORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (UG/KG)

COMPOUND	SD-F2	SD-F3
Chloromethane	U	U
Bromomethane	U	U
Vinyl Chloride	U	U
Chloroethane	U	U
Methylene Chloride	U	U
Acetone	U	16
Carbon Disulfide	U	U
1,1-Dichloroethene	U	U
1,1-Dichloroethane	U	U
Trans-1,2-Dichloroethane	U	U
Chloroform	U	U
1,2-Dichloroethane	U	U
2-Butanone	U	U
1,1,1-Trichloroethane	U	U
Carbon Tetrachloride	U	U
Vinyl Acetate	U	U
Bromodichloromethane	U	U
1,2-Dichloropropane	U	U
Trans-1,3-Dichloropropene	U	U
Trichloroethene	U	U
Dibromochloromethane	U	U
1,1,2-Trichloroethane	U	U
Benzene	U	U
cis-1,3-Dichloropropene	U	U
2-Chloroethylvinylether	U	U
Bromoform	U	U
4-Methyl-2-Pentanone	U	U
2-Hexanone	U	U
Tetrachloroethene	U	U
1,1,2,2-Tetrachloroethane	U	U
Toluene	U	U
Chlorobenzene	U	U
Ethylbenzene	U	U
Styrene	U	U
Total Xylenes	U	U

U= Below CRDL   R= Unuseable data

Table 3-19 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (UG/KG)

COMPOUND	SD-A-1	SD-A-2	SD-A-3	SD-A-4	SD-B-1	SD-B-1D	SD-B-2
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U
Benzoic acid	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	R	R	U
4-Chloroaniline	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	450	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U	U	U
Fluorene	U	U	U	U	R	R	U
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U
Phenanthrene	U	360	U	U	R	R	U
Anthracene	U	U	U	U	R	R	U
Di-n-butylphthalate	U	U	U	U	R	R	U
Fluoranthene	U	420	420	U	R	R	U
Pyrene	U	U	U	U	R	R	U
Butylbenzylphthalate	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	R	U	U
Chrysene	U	U	U	U	R	R	U
bis(2-Ethylhexyl)phthalate	610	1000	1000	820	2400	1800	1300
Di-n-octylphthalate	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	R	R	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U
Benzo(a)pyrene	U	U	U	U	R	R	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U	U	U
[illegible]-Nitroaniline	U	U	U	U	U	U	U

U= Below CRDL   R= Unusable Data

Table 3-19 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRQL (UG/KG)

COMPOUND	SD-B-3	SD-B-4	SD-C-1	SD-C-2	SD-C-3	SI-[illegible]	SI-D1
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U
Benzoic acid	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	430	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U	U	U
Fluorene	U	U	U	740	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U
Phenanthrene	U	160	U	330	U	U	[illegible]
Anthracene	U	U	U	8[illegible]	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U
Fluoranthene	U	[illegible]	U	3000	U	U	490
Pyrene	U	[illegible]	U	1900	U	U	330
Butylbenzylphthalate	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U
Benzo(a)anthracene	U	460	U	[illegible]	U	U	U
Chrysene	U	460	U	1900	U	U	U
bis(2-Ethylhexyl)phthalate	3700	1600	830	[illegible]	1100	1300	690
Di-n-octylphthalate	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	[illegible]	U	[illegible]	U	U	U
Benzo(k)fluoranthene	U	U	U	[illegible]	U	U	U
Benzo(a)pyrene	U	420	U	1600	U	U	U
Indeno(1,2,3-cd)Pyrene	U	U	U	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U
Benzo(g,h,i)Perylene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U

U= Below CRQL   R= Unusable data

Table 3-19 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (UG/KG)

COMPOUND	SD-D-2	SD-D-3	SD-D4-4	SD-E-2	SD-E-3	SD-E-4	SD-F-1
Phenol	U	U	U	U	U	U	U
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U
Benzyl alcohol	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U
bis(2-Chloroisopropyl)ether	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U
N-Nitroso-di-n-dipropylamine	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U
Benzoic acid	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U
Naphthalene	U	U	R	U	330	420	1300
4-Chloroaniline	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	R	U	U	U	640
Hexachlorocyclopentadiene	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	900
2,6-Dinitrotoluene	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	330	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	900
2,4-Dinitrotoluene	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U
4-Chlorophenyl-phenyl ether	U	U	U	U	U	U	U
Fluorene	U	U	U	U	380	540	1600
4-Nitroaniline	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U
N-nitrosodiphenylamine	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U
Phenanthrene	U	360	2200	1400	3300	3100	7300
Anthracene	U	U	400	350	630	820	2100
Di-n-butylphthalate	U	U	U	U	U	U	580
Fluoranthene	U	U	1400	2000	4800	3600	9400
Pyrene	U	U	960	1100	2300	1800	U
Butylbenzylphthalate	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	1100
Benzo(a)anthracene	U	U	880	780	2400	1400	4600
Chrysene	U	U	760	720	2300	2300	U
bis(2-Ethylhexyl)phthalate	580	710	760	1100	U	U	1800
Di-n-octylphthalate	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	600	870	3200	1300	U
Benzo(k)fluoranthene	U	U	1000	U	U	U	7000
Benzo(a)pyrene	U	U	680	650	2200	1300	2600
Indeno(1,2,3-cd)Pyrene	U	U	U	U	1400	770	U
Dibenzo(a,h)Anthracene	U	U	U	U	420	U	U
Benzo(g,h,i)Perylene	U	U	U	U	[illegible]	[illegible]	U
3-Nitroaniline	U	U	U	U	U	U	U

U= Below CRDL   R= Unuseable data

Table 3-19 (cont.)

AUTO ION SITE
SEMI-VOLATILE ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRQL (UG/KG)

COMPOUND	SD-F-2	SD-F-3
Phenol	U	U
bis(2-Chloroethyl)ether	U	U
2-Chlorophenol	U	U
1,3-Dichlorobenzene	U	U
1,4-Dichlorobenzene	U	U
Benzyl alcohol	U	U
1,2-Dichlorobenzene	U	U
2-Methylphenol	U	U
bis(2-Chloroisopropyl)ether	U	U
4-Methylphenol	U	U
N-Nitroso-di-n-dipropylamine	U	U
Hexachloroethane	U	U
Nitrobenzene	U	U
Isophorone	U	U
2-Nitrophenol	U	U
2,4-Dimethylphenol	U	U
Benzoic acid	U	U
bis(2-Chloroethoxy)methane	U	U
2,4-Dichlorophenol	U	U
1,2,4-Trichlorobenzene	U	U
Naphthalene	430	U
4-Chloroaniline	U	U
Hexachlorobutadiene	U	U
4-Chloro-3-methylphenol	U	U
2-Methylnaphthalene	430	U
Hexachlorocyclopentadiene	U	U
2,4,6-Trichlorophenol	U	U
2,4,5-Trichlorophenol	U	U
2-Chloronaphthalene	U	U
2-Nitroaniline	U	U
Dimethylphthalate	390	U
Acenaphthylene	U	U
2,6-Dinitrotoluene	U	U
3-Nitroaniline	U	U
Acenaphthene	U	U
2,4-Dinitrophenol	U	U
4-Nitrophenol	U	U
Dibenzofuran	U	U
2,4-Dinitrotoluene	U	U
Diethylphthalate	U	U
4-Chlorophenyl-phenyl ether	U	U
Fluorene	U	U
4-Nitroaniline	U	U
4,6-Dinitro-2-methylphenol	U	U
N-Nitrosodiphenylamine	U	U
4-Bromophenyl-phenylether	U	U
Hexachlorobenzene	U	U
Pentachlorophenol	U	U
Phenanthrene	1400	U
Anthracene	350	U
Di-n-butylphthalate	520	U
Fluoranthene	2200	U
Pyrene	910	U
Butylbenzylphthalate	U	U
3,3'-Dichlorobenzidine	U	U
Benzo(a)anthracene	1000	U
Chrysene	870	U
bis(2-Ethylhexyl)phthalate	1700	660
Di-n-octylphthalate	U	U
Benzo(b)fluoranthene	690	U
Benzo(k)fluoranthene	480	U
Benzo(a)pyrene	780	U
Indeno(1,2,3-cd)Pyrene	610	U
Dibenzo(a,h)Anthracene	U	U
Benzo(g,h,i)Perylene	520	U
3-Nitroaniline	U	U

U= Below CRQL R= Unuseable data

Table 3-20

AVIATION SITE
PESTICIDE/PCB ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE RDL (UG/KG)

COMPOUND	SD-D1-2	SD-D2-2	SD-E3-2	SD-E4-2
alpha-BHC	U	U	U	U
beta-BHC	U	U	U	U
delta-BHC	U	U	U	U
gamma-BHC (Lindane)	U	U	U	U
Heptachlor	U	U	U	U
Aldrin	U	U	U	U
Heptachlor epoxide	U	U	U	U
Endosulfan I	U	U	U	U
Dieldrin	U	U	U	U
4,4'-DDE	U	U	U	U
Endrin	U	U	U	U
Endosulfan II	U	U	U	U
4,4'-DDD	U	U	U	U
Endosulfan sulfate	U	U	U	U
4,4'-DDT	U	U	U	U
Methoxychlor	U	U	U	U
Endrin ketone	U	U	U	U
alpha-Chlordane	U	U	U	U
Toxaphene	U	U	U	U
Aroclor-1016	U	U	U	U
Aroclor-1221	U	U	U	U
Aroclor-1232	U	U	U	U
Aroclor-1242	U	1200.0	U	16000.0
Aroclor-1248	U	U	U	U
Aroclor-1254	420.0	1500.0	82.00	U
Aroclor-1260	U	U	U	4700.0

U- Below RDL R- Unuseable data

Table 3-21

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (MG/KG)

METAL	SD-A1	SD-A2	SD-A3	SD-A4	SD-B1	SD-B1D	SD-B2	SD-B3
Aluminum	959	952	1162	1377	1767	1161	1200	2620
Antimony	R	R	R	R	R	R	R	R
Arsenic	U	U	U	2.0	U	U	U	5.6
Barium	U	U	U	U	U	U	U	62.0
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	47600	23900	29400	42800	39700	30700	46000	81700
Chromium	17.0	19.0	19.0	16.0	19.0	18.0	17.0	23.0
Cobalt	U	U	U	U	U	U	U	U
Copper	U	U	14.0	6.0	10.0	6.4	U	14.0
Iron	3669	3805	4345	5784	14900	6501	4978	13200
Lead	15.0	18.0	11.0	13.0	35.0	20.0	R	208.0
Cyanide	R	R	R	R	R	R	R	R
Magnesium	9016	3666	5495	9219	12300	4660	13100	36500
Manganese	207.0	189.0	256.0	191.0	249.0	189.0	253.0	294.0
Mercury	U	U	U	U	0.20	U	0.10	U
Nickel	U	U	16.0	U	U	U	U	12.0
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	R	R	R	R	R	R	R	R
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	U	U	U	U	U	15.0
Zinc	31.0	38.0	31.0	21.0	52.0	40.0	25.0	82.0

U= Below CRDL R= Unuseable data

Table 3-21 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (MG/KG)

METAL	SD-B4	SD-C1	SD-C2	SD-C3	SD-C4	SD-D1	SD-D2	SD-D3
Aluminum	2203	960	739	663	738	1084	1931	1617
Antimony	R	R	R	R	R	R	R	R
Arsenic	U	U	2.5	U	U	U	U	U
Barium	U	U	U	U	U	U	U	U
Beryllium	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U
Calcium	45600	37500	82100	37100	40300	26900	62400	68500
Chromium	24.0	19.0	13.0	12.0	18.0	17.0	16.0	23.0
Cobalt	U	U	U	U	U	U	U	U
Copper	11.0	U	13.0	6.4	6.6	37.0	U	U
Iron	19100	6193	4747	4156	5907	4968	5583	7729
Lead	63.0	43.0	19.0	8.0	43.0	31.0	8.6	24.0
Cyanide	R	R	R	R	R	R	R	R
Magnesium	9687	7502	14000	8430	9252	7539	11200	24800
Manganese	282.0	177.0	243.0	131.0	203.0	189.0	205.0	274.0
Mercury	0.70	U	U	0.10	U	1.90	0.20	0.20
Nickel	U	U	U	U	U	U	U	U
Potassium	U	U	U	U	U	U	U	U
Selenium	U	U	U	U	U	U	U	U
Silver	R	R	R	R	R	R	R	R
Sodium	U	U	U	U	U	U	U	U
Thallium	U	U	U	U	U	U	U	U
Vanadium	U	U	U	U	U	U	U	U
Zinc	74.0	58.0	27.0	17.0	51.0	53.0	26.0	44.0

U= Below CRDL R= Unuseable data

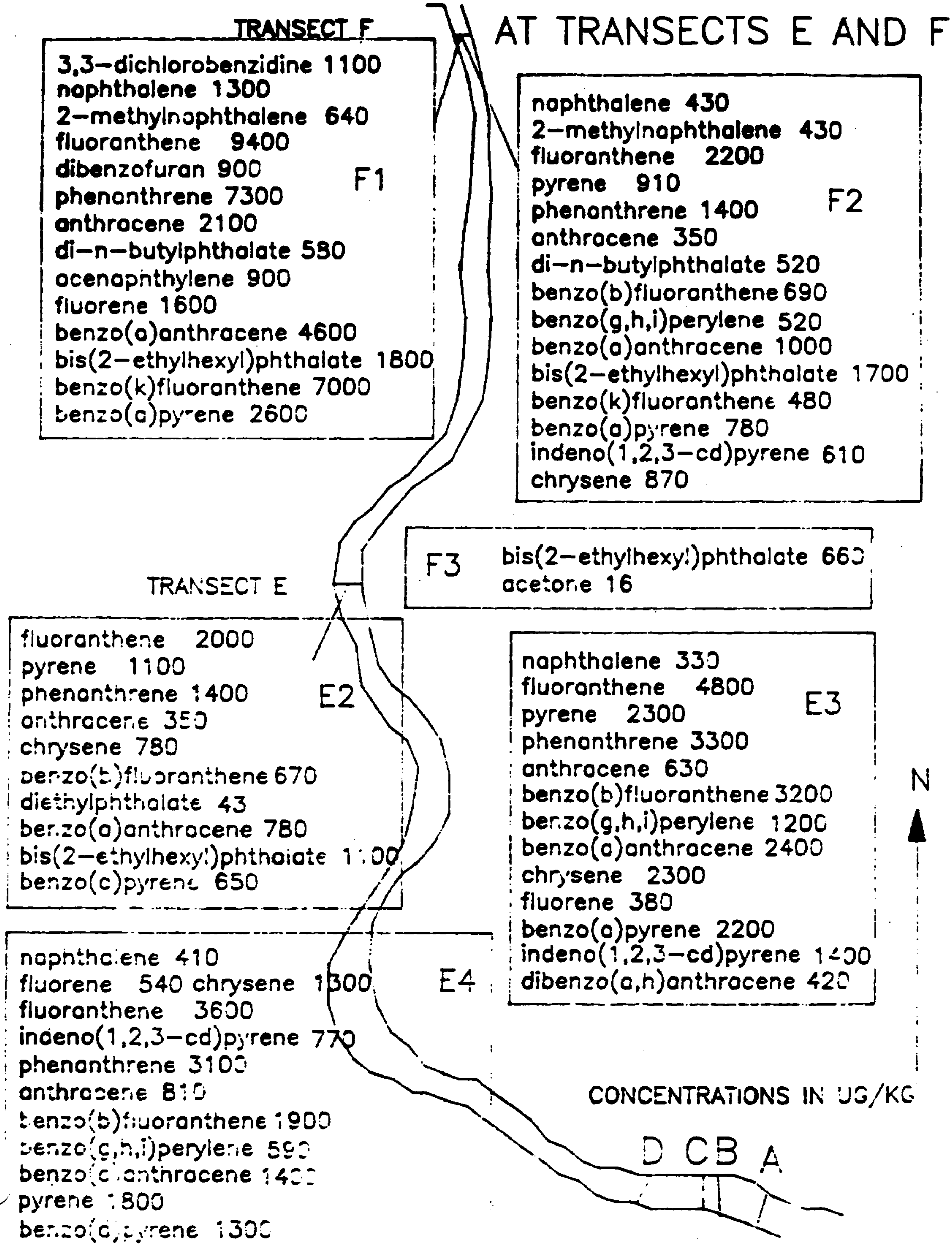
Table 3-21 (cont.)

AUTO ION SITE
INORGANIC ANALYSIS SUMMARY SHEET FOR SEDIMENTS
ALL USEABLE DATA ABOVE CRDL (MG/KG)

METAL	SD-D4	SD-E2	SD-E3	SD-E4	SD-F1	SD-F2	SD-F3
Aluminum	1325	2710	2870	1410	2550	1460	[illegible]
Antimony	R	R	R	R	R	R	R
Arsenic	U	9.0	5.9	3.2	6.5	2.8	U
Barium	95.0	65.0	U	U	U	U	U
Beryllium	U	U	U	U	U	U	U
Cadmium	U	1.6	2.0	[illegible]	U	U	U
Calcium	35100	24600	51000	46700	23600	29600	35600
Chromium	[illegible]	27.0	31.0	26.0	54.0	22.0	23.0
Cobalt	U	U	U	U	U	U	U
Copper	[illegible]	45.0	66.0	13.0	44.0	[illegible]	9.0
Iron	11100	16700	16200	6760	10800	6920	6950
Lead	71.0	77.0	99.0	75.0	189.0	31.0	20.0
Cyanide	R	0.0	0.0	0.0	0.0	0.0	0.0
Magnesium	[illegible]	7070	8420	8370	4530	[illegible]	[illegible]
Manganese	[illegible]	[illegible]	[illegible]	140.0	336.0	[illegible]	[illegible]
Mercury	U	[illegible]	[illegible]	[illegible]	0.47	U	U
Nickel	[illegible]	[illegible]	17.0	14.0	[illegible]	U	[illegible]
Potassium	U	U	U	U	U	U	U
Selenium	U	[illegible]	0.0	0.0	0.0	0.0	0.0
Silver	R	U	[illegible]	[illegible]	U	U	U
Sodium	U	U	U	U	U	U	U
Thallium	U	U	[illegible]	U	U	U	U
Vanadium	U	[illegible]	U	U	U	U	U
Zinc	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	39.0	[illegible]

U= Below CRDL R= Unuseable data

FIGURE 3-J ORGANIC ANALYSES ABOVE CRDL AT TRANSECTS E AND F



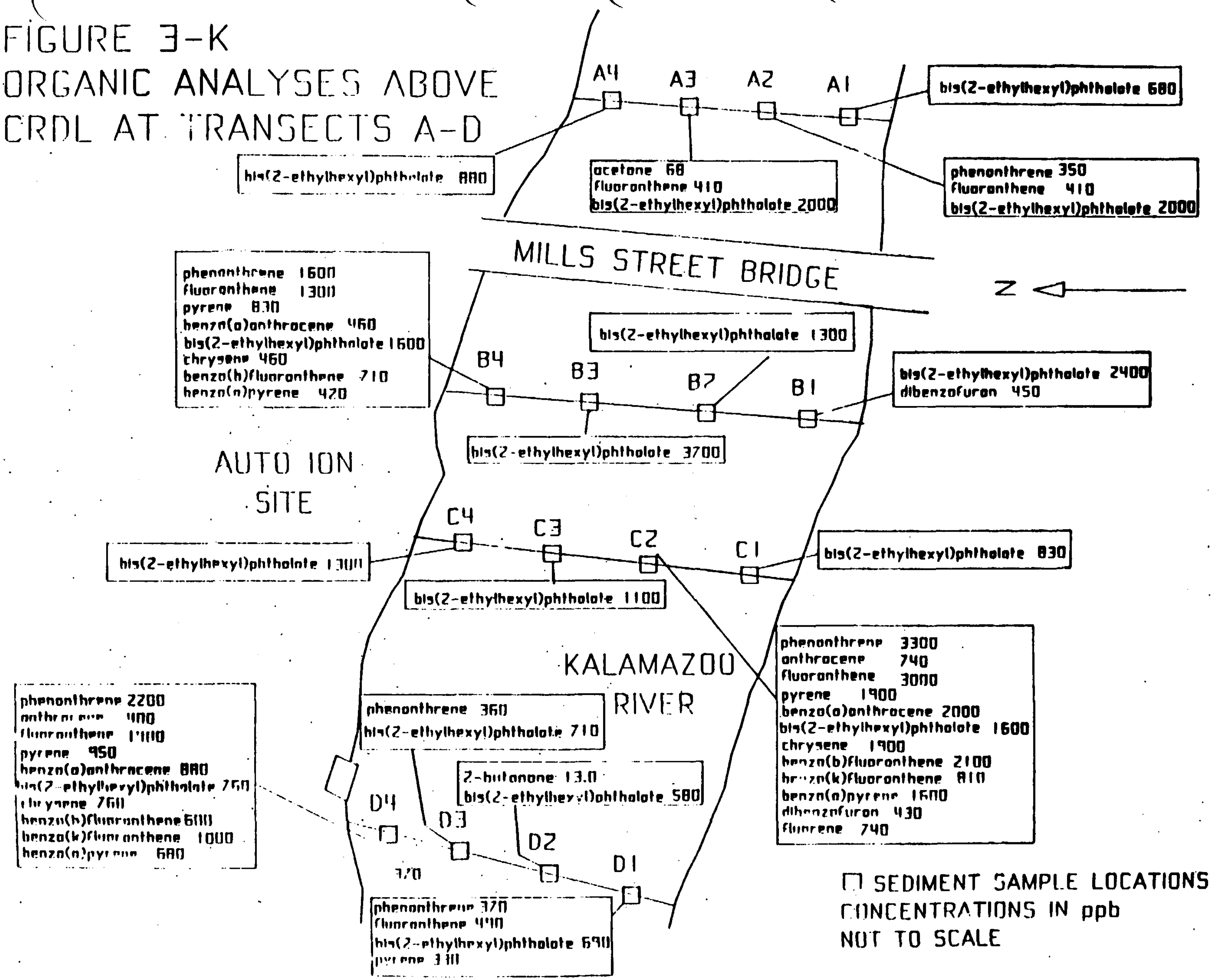


FIGURE 3-K
ORGANIC ANALYSES ABOVE CRDL AT TRANSECTS A-D

FIGURE 3-L INORGANIC ANALYSES ABOVE CRDL AT TRANSECTS E AND F

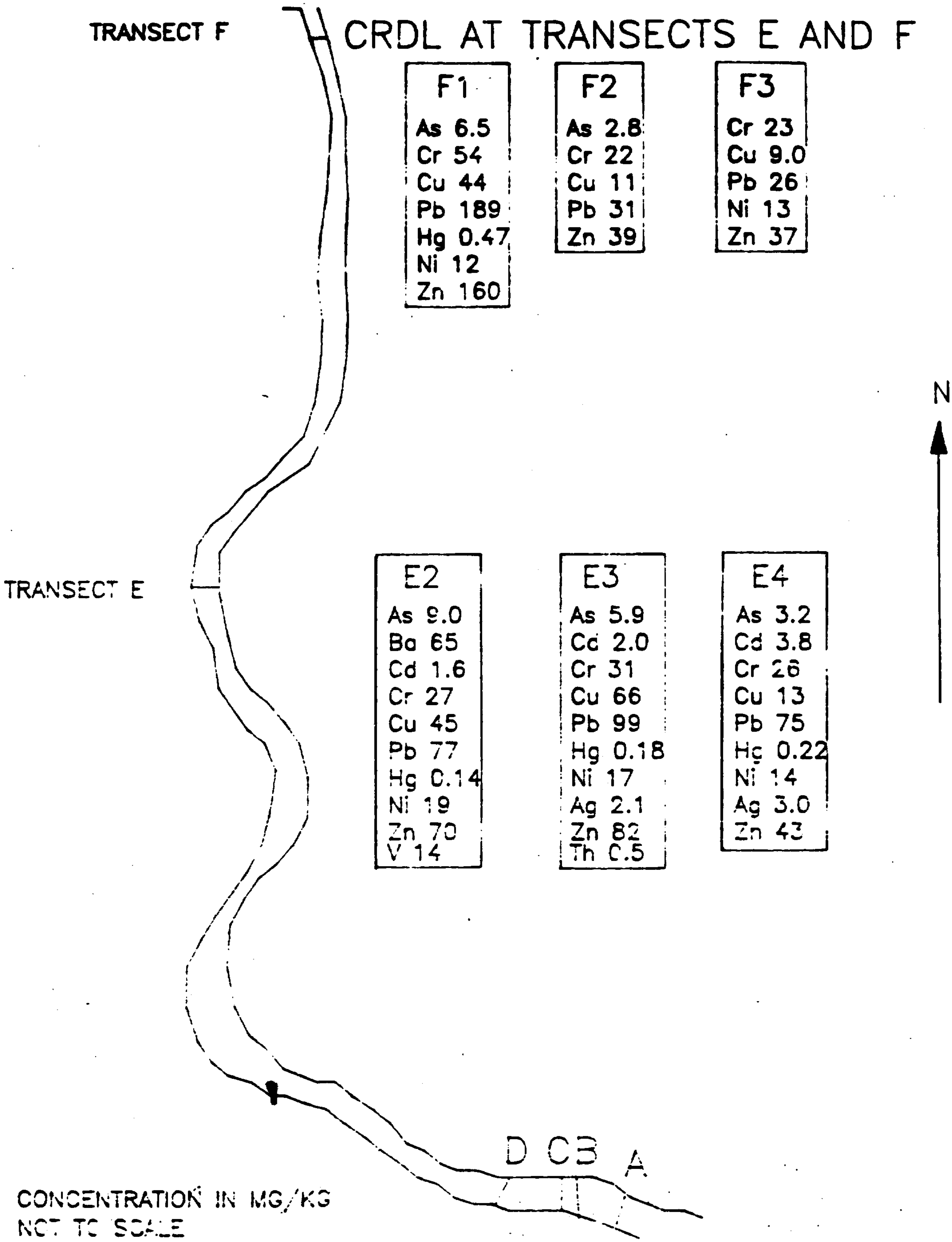
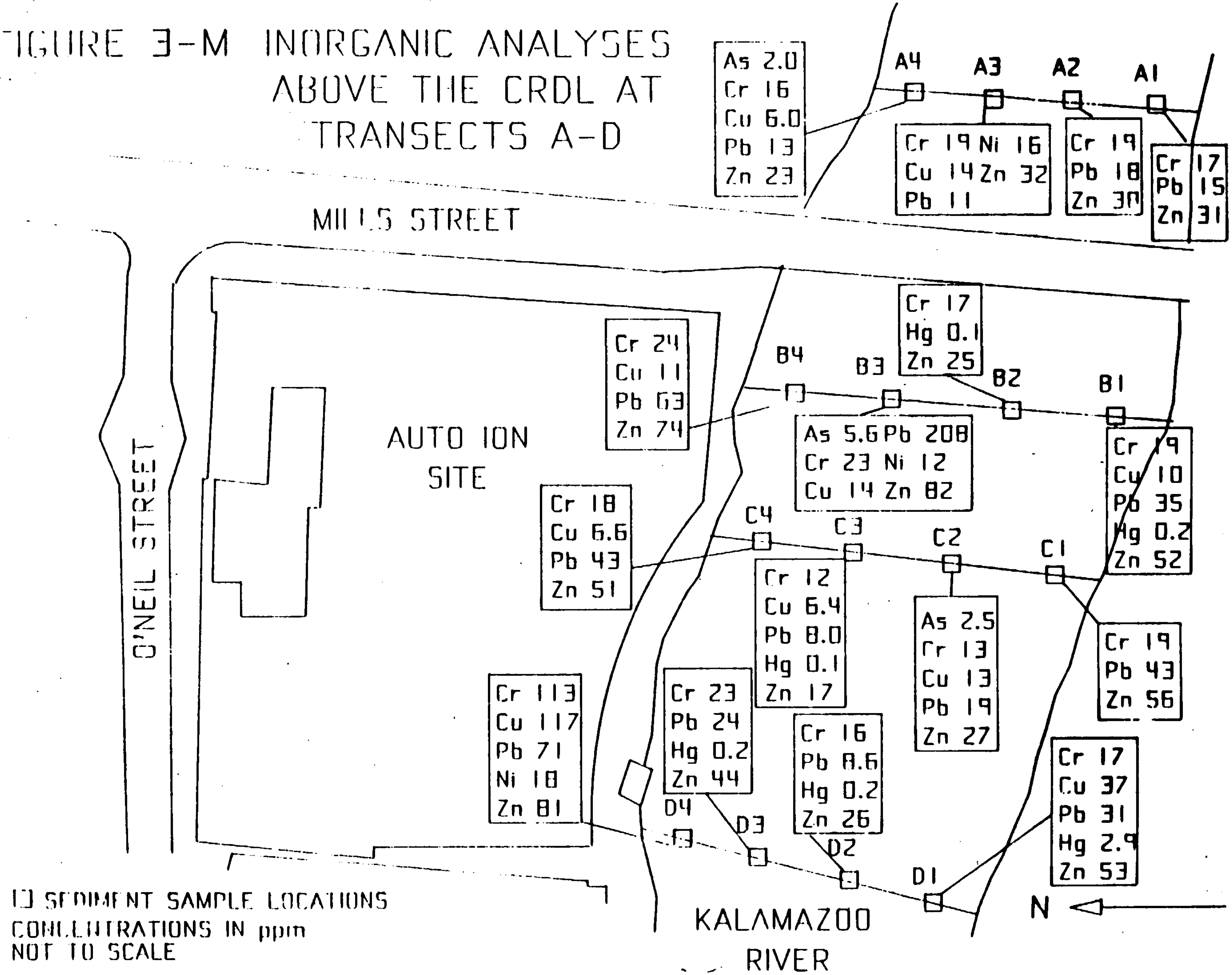


FIGURE 3-M INORGANIC ANALYSES ABOVE THE CRDL AT TRANSECTS A-D



Acetone was detected in two of the samples (A-2 and F-3). The A-transect is located upstream from the Site and represents background sampling stations while the F-transect lies approximately 1 mile downstream from the Site. 2-Butanone was detected only in D-2 at 13 ug/kg.

Aromatic hydrocarbons and phthalate esters were present in the base neutral fraction of the semivolatile analyses. Three phthalate compounds were detected in the samples. Bis(2-ethylhexyl)phthalate was determined to be above detection levels in all but two of the samples, varying from 580 to 3,700 ug/kg. Di-n-butylphthalate was present in E-4 (520 ug/kg) and F-1 (520 ug/kg). It was below detection in all other sediment samples but was present in the field blank at 130 ug/kg. Diethylphthalate was detected only in E-2 (43 ug/kg).

The rest of the base neutral semivolatiles above CRDL ranged from 330 ug/kg for naphthalene and pyrene to 9,400 ug/kg for fluoranthene. 4-methylphenol was detected in one sample, F-3, at 260 ug/kg, 1 mile downstream from the Site and downstream from a waste disposal facility. Bis(2-ethylhexyl)phthalate was the only organic compound detected in sediment samples A1, A4, B2, B3, C1, C3, and C4. Bis(2-ethylhexyl) phthalate was detected in all but two of the sediment samples and was present at 110 ug/kg in the field blank taken from decontamination water. Fluoranthene and phenanthrene were also detected in a majority of the samples. Sediment samples containing a larger variety of detected organic compounds were B-4, C-2 and D-4 within the vicinity of the Site. Both the E and F transects, which were sampled a considerable distance from the Auto Ion Site, often contained a greater variety and higher concentrations of detectable semivolatile compounds than those transects at the Site.

Aluminum, calcium, chromium, iron, lead, magnesium, manganese and zinc were detected in all samples. Magnesium values were higher than typical soil concentrations for a majority of samples including those sampled as background on the A-transect. This may be a result of the composition of drift and bedrock material in the Kalamazoo area. Calcium values ranged from 23,600 mg/kg to 82,100 mg/kg. Chromium values were similar to background values in all samples but D4 and F-1. D-4 was ten times the concentration of background samples and F-1 was also somewhat elevated above background. Aluminum values ranged from 952 to 2,870 mg/kg with highest values occurring in E3, E2, B3 and F1. Lead values were 10 times higher in concentration in samples B3 (208 mg/kg) and F1 (189 mg/kg) than in the A-transect background range of 11-18 mg/kg. Sample F1 also contained the highest zinc concentration of 160 mg/kg. Detectable arsenic concentrations were located on the E and F transects and in A4 (2 mg/kg), B3 (5.6 mg/kg) and C2 (2.5 mg/kg). Cadmium was detected in three samples (1.6 mg/kg, 2.0 mg/kg, 3.8 mg/kg). All three of these samples lie on the E-transect approximately 1/2 mile downstream from the Site. Copper was detected in 75% of the sediments sampled with concentrations ranging from 6 to 117 mg/kg. Background values ranged from 6 to 14 mg/kg. Highest concentrations of copper were detected in D4 (117 mg/kg), E2 (45 mg/kg), E? (66 mg/kg) and F1 (44 mg/kg). Mercury was present in the E and F transects, D3, D2, D1, B1, B2 and B4. Higher values occurred at F1, D1, and B4. Nickel was detected in one background sample (A3, 16 mg/kg), B3, D4 and the E and F transects. Silver was detected at E3 and E4. However, a majority of silver analyses and cyanide analyses were invalidated during QA/QC, making comparisons impossible (See Appendix V for details.).

The E and F transects, as with the organic analyses, contained the greatest variety and often the highest concentrations of detectable metals. Both of these sampling transects are far downstream from the Auto Ion Site and the F-transect lies downstream from a waste disposal plant. The D transect also contained a number of detectable metals. The D transect lies directly downstream from a water outfall area determined in earlier investigations to be an area of potential discharge.

River sediment samples taken during the second round were also analyzed for pesticides and PCB's. PCB's were detected in two samples along transect D, located just downstream of the Auto Ion Site. Sediment sample location D1-2 results indicate the presence of Aroclor 1254 at 420 ug/Kg, while 1200 ug/Kg of Aroclor 1242 and 1500 ug/Kg Aroclor 1254 were detected at location D2-2. PCB's were also detected along transect F located approximately one mile downstream of the Auto Ion Site. Aroclor 1254 was detected at 82 ug/Kg at sediment sample location F3-2, while 16,000 ug/Kg of Aroclor 1,242 and 4,700 ug/Kg of Aroclor 1260 were detected at location F4-2. Results of the pesticide/PCB analyses are listed in Table 3-20.

In order to assess the chemical data obtained for the river sediments a better understanding of the physical parameters of the river must be established. Cross-sections of the river, and cross-sectional velocity distributions are necessary to determine the variations in transport capabilities at each transect. During the sampling done in March, 1988 many areas in the river were found to be highly armored making sampling difficult. To obtain a quantity suitable for laboratory analysis, some bias in sampling took place. Sandy-silty sediments were sought out due to the ease of sampling. Sandy-silty material would exist in a different depositional environments than would the armored gravels. The nature of the sediments, i.e. organic debris versus gravel, will also influence ability of a sediment to retain contaminants.

3.7.3.3 Other Discharges. An examination of permitted discharges to the river within the vicinity of the Site (Appendix VII) revealed that some of the detected compounds present in the sediment analytical results were present in addition to other compounds found in the discharge of other active facilities. The Michigan Department of Mental Health, Kalamazoo Regional Psychiatric Hospital is permitted to discharge selenium and mercury into Arcadia Creek. The outlet of Arcadia Creek into the Kalamazoo River is unclear but it appears from the topographic map to be upstream from transects E and F. Lakeside Refining discharges into Davis Creek, located upstream from all sample locations; its effluent may contain 1,1,1-trichloroethane, oil and grease, phenols, and ammonia. The city of Kalamazoo is discharging effluent to the river at the facility on North Harrison; this can include cadmium, lead, silver, cyanide and 1,2-dichloroethene. General Signal Corporation is discharging some oil and grease with their effluent from the facility on East Michigan Avenue. Upjohn Company is authorized to discharge chlorine, phosphorous, benzene, 1,2 dichloroethane, chlorobenzene, t-butanol and methylene chloride into Portage Creek. In addition to these known inputs there are a number of waste treatment facilities upstream from the Site on the Kalamazoo River. The area is also heavily industrialized and many potential discharge and runoff points may exist near the river.

3.8 Subsurface Drum Investigation

3.8.1 Purpose. During the RI field work the MDNR requested that an investigation be undertaken to determine if allegations concerning buried drums at the Site were in fact true. After the PRP Committee, U.S. EPA, and MDNR came to an agreement to initiate the investigation, HART personnel conducted a preliminary subsurface Site characterization in the suspect area. This suspect area was located in the northeast corner of the fenced Site. Findings of this preliminary survey indicated that there were underlying metal objects within the suspect area. Based on these findings, it was proposed that an excavation of the suspect area be undertaken to make a final determination as to the existence of buried drums.

3.8.2 Methodology. The first phase of this investigation consisted of surveying the entire suspect area with a metal detector. The locations of anomalies identified during the metal detector survey were noted by the field team for the upcoming excavation. The subsurface excavation was performed by Environmental Management Control Inc. (EMC) of Genoa, Ohio. A long trench was dug using a backhoe which was equipped with a separate air-supply source. During the trench excavation the backhoe operator utilized Level B protection, while two HART personnel and an MDNR representative wore Level C and maintained constant air monitoring. Level B protection was nearby and would have been used if ambient air levels exceeded 5 ppm and was sustained for five minutes of organic vapors or if drums were discovered.

The excavation began approximately five feet from the east fence, in the northeast corner of the Site, and continued in a westerly direction (Figure 3-N). Two spotters stood at the east end of the trench while a HART person stood by the backhoe and monitored the air. The trench was

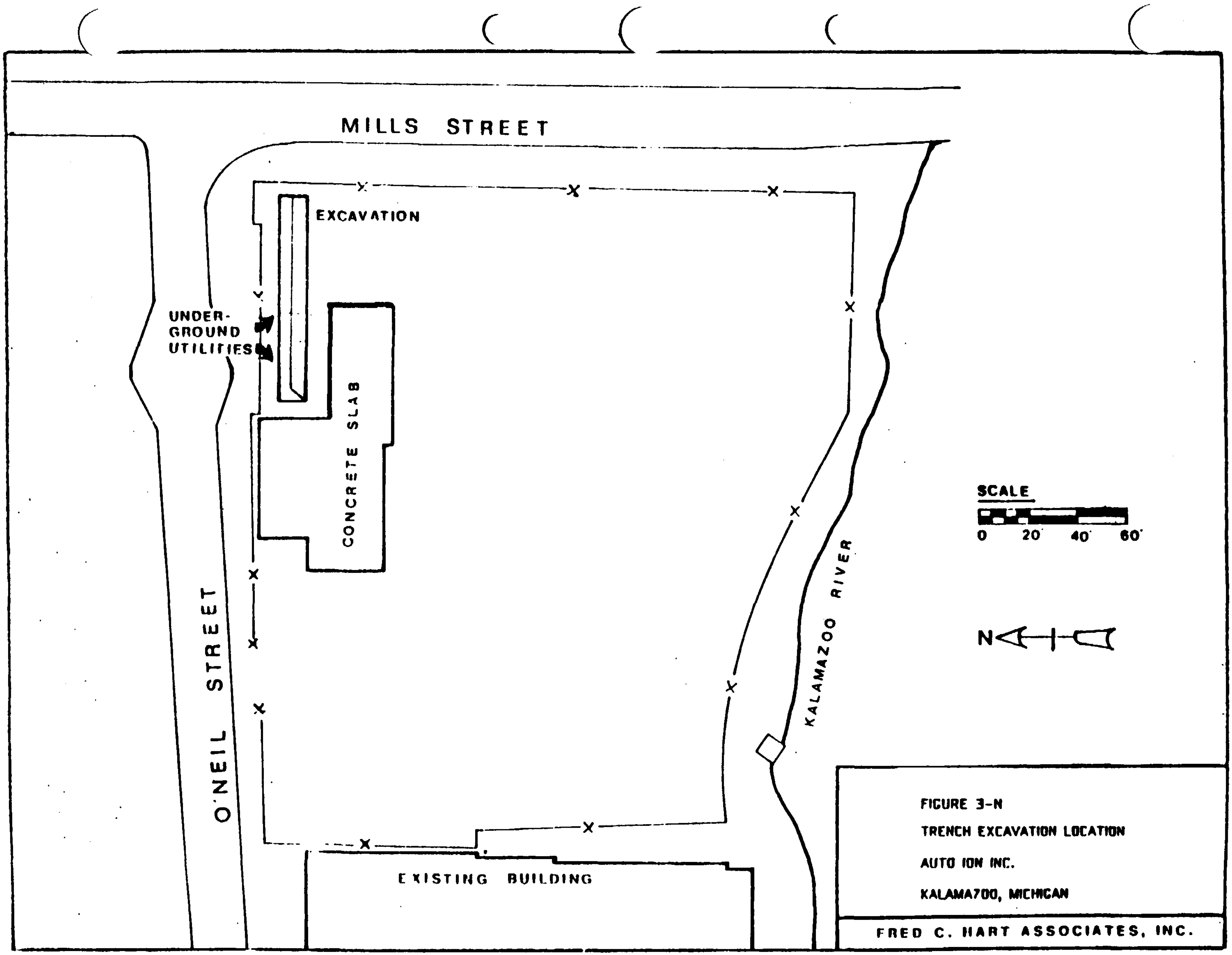


FIGURE 3-N
TRENCH EXCAVATION LOCATION
AUTO ION INC.
KALAMAZOO, MICHIGAN

FRED C. HART ASSOCIATES, INC.

dug approximately 8-10 feet deep and about 10 feet wide. The work was conducted under MDNR and USEPA observation and proceeded in a slow and cautious manner to prevent damage to any drums that might be encountered.

3.8.3 Findings. The trench was taken to within 15 feet of a cement foundation. Three utility lines were uncovered. The conclusion of the trench excavation were that there was no evidence of earlier excavations, no drums were encountered, and there were no readings of volatile organics above the background ambient air. Based on the above information it was concluded that there was no basis to the allegation that drums were buried in the northeast corner of the fenced Site.

3.9 Waste Water Disposal

Under the guidance of the RI work plan all water generated through decontamination, drilling, well development and sampling activities was collected and stored in a pool and a plastic lined box. Drilling mud used at the Site was also stored in the pool.

The waste was disposed of to the City of Kalamazoo Waste Water Treatment Plant (Appendix VIII).

4.0 GEOLOGY AND HYDROGEOLOGY

4.1 Introduction

An understanding of the geology and hydrogeology is necessary to assess the potential for contaminant migration from the Site. Information obtained from test boring logs provides the basis for the following discussions of regional and Site geology and hydrogeology.

4.2 Geology

4.2.1 Regional Geology. The Auto Ion Site is located on the southwestern edge of the Michigan Basin, an intercratonic basin which has existed in some form since Precambrian time. Underlying bedrock is of Paleozoic age and consists of (from oldest to youngest): Cambrian sandstone and limestone of the Lake Superior and Prairie du Chien overlying an extensively eroded Precambrian surface, the shale and limestone of the Trenton-Black River and Eden Groups of Ordovician age, the Silurian age Richmond, Cataract, Niagara and Saline Groups, the Devonian Detroit River Group, the shale and limestone of the Traverse Group and the Coldwater Shale of the late Devonian to early Mississippian.

Rocks of the Michigan Basin are overlain unconformably by Pleistocene glacial deposits as well as associated lake beds, spillways, outwash and glacial channels. In Kalamazoo Township, the glacial drift ranges from 50 feet to 300 feet in thickness (Forstat, et al., 1983).

4.2.2 Site Geology. Glacial deposits lying unconformably above the Mississippian age Coldwater Shale are approximately 100 feet in thickness. Drift consists primarily of a medium grained sand interbedded with gravel, silt and clay. Clay lenses are also present in this region. Overlying fill material ranges in thickness from two feet to approximately twelve feet and consists of fine to medium grained sands mixed with gravel, brick and cinder fragments as well as organic material (Figures 4-A through 4-D).

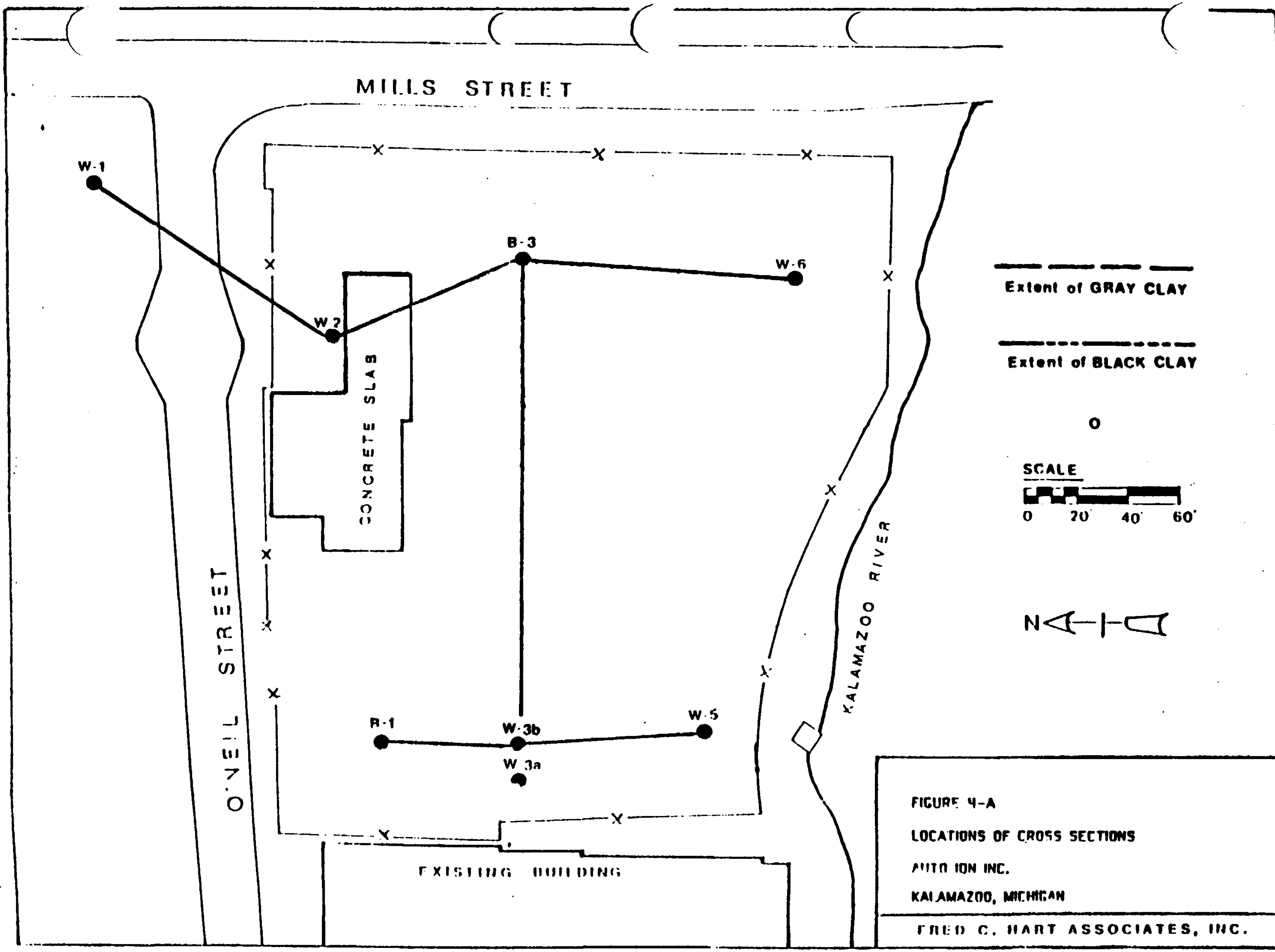


FIGURE 4-A

LOCATIONS OF CROSS SECTIONS

AUTO ION INC.

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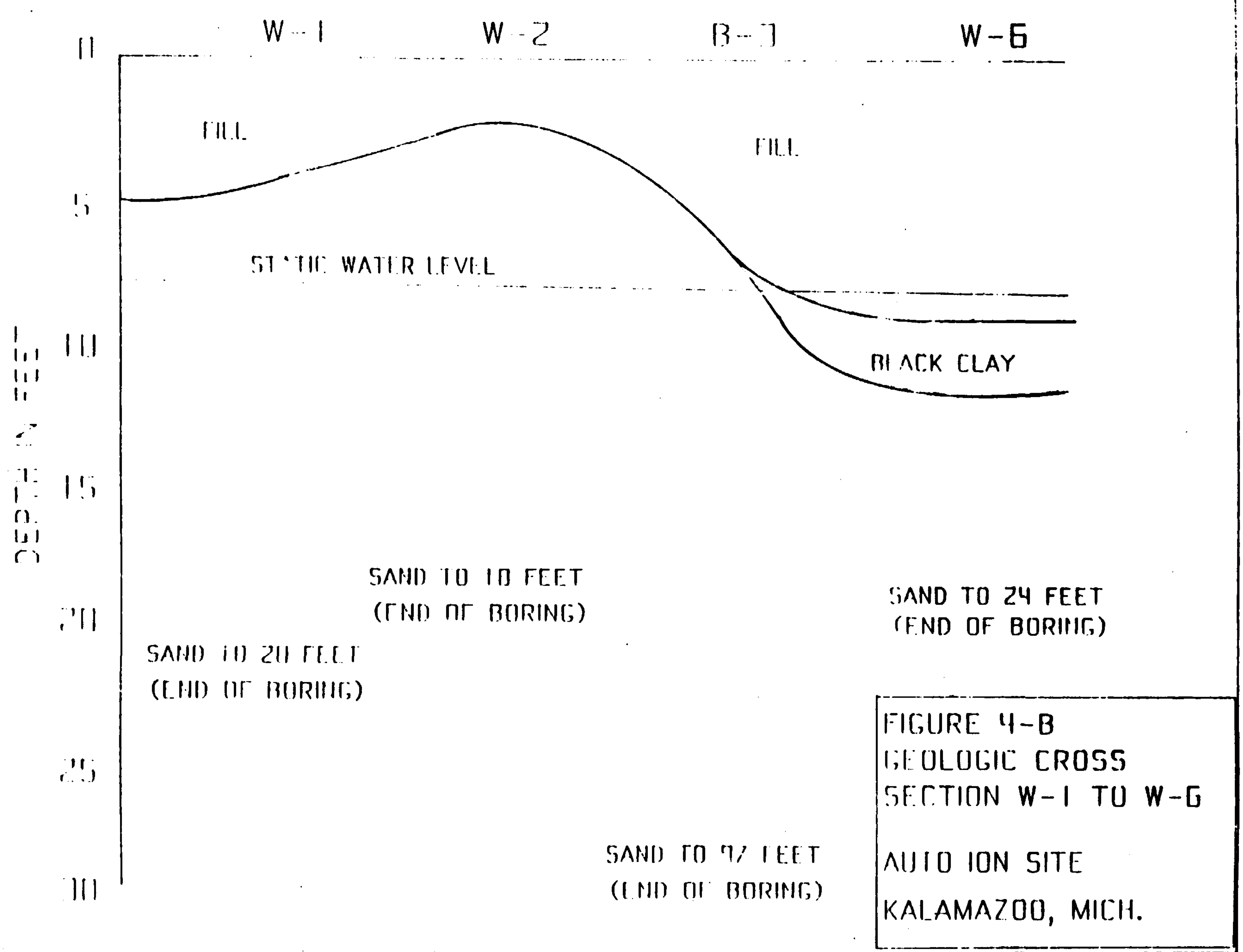


FIGURE 4-B
GEOLOGIC CROSS
SECTION W-1 TO W-6

AUTO ION SITE

KALAMAZOO, MICH.

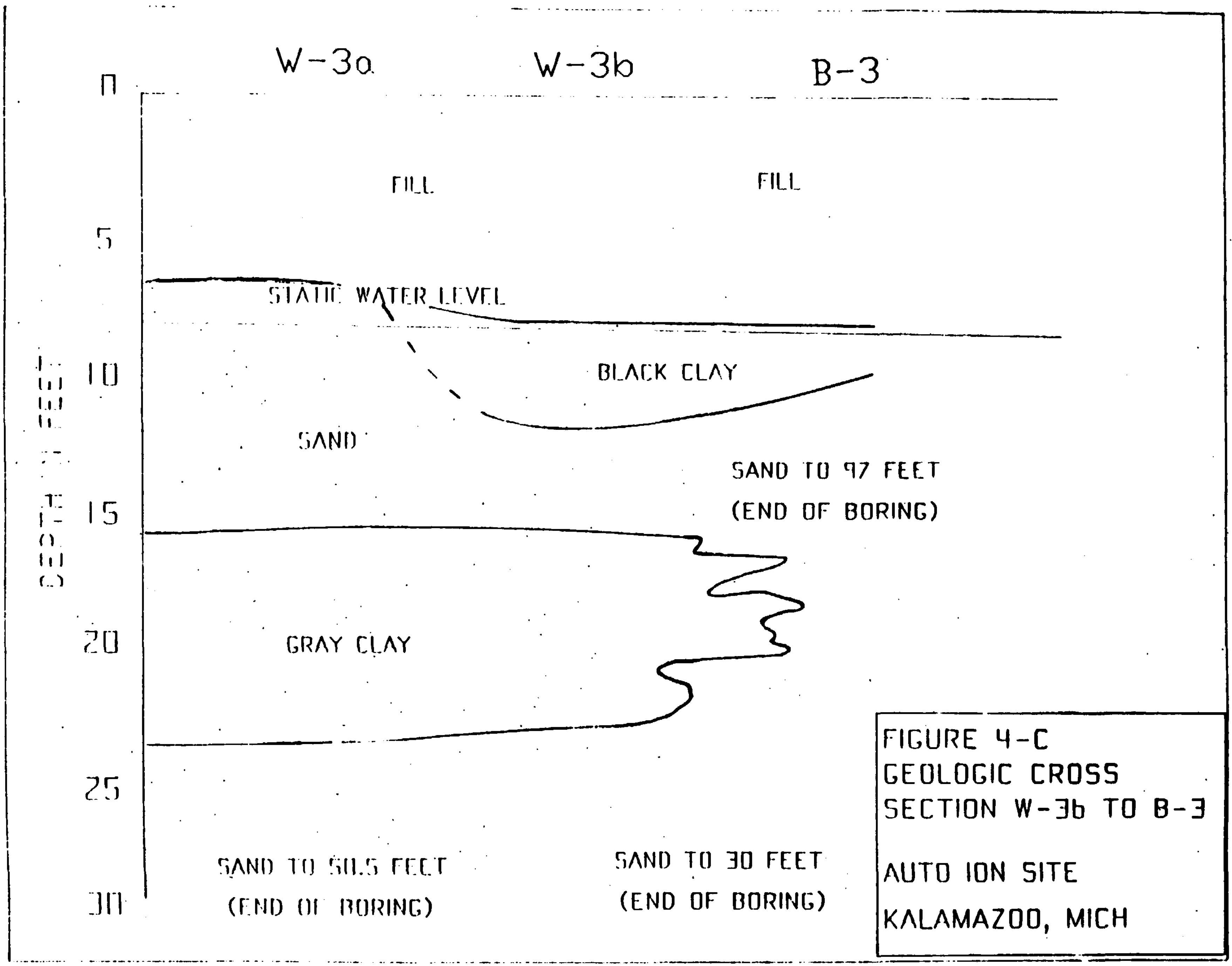


FIGURE 4-C
GEOLOGIC CROSS
SECTION W-3b TO B-3

AUTO ION SITE
KALAMAZOO, MICH

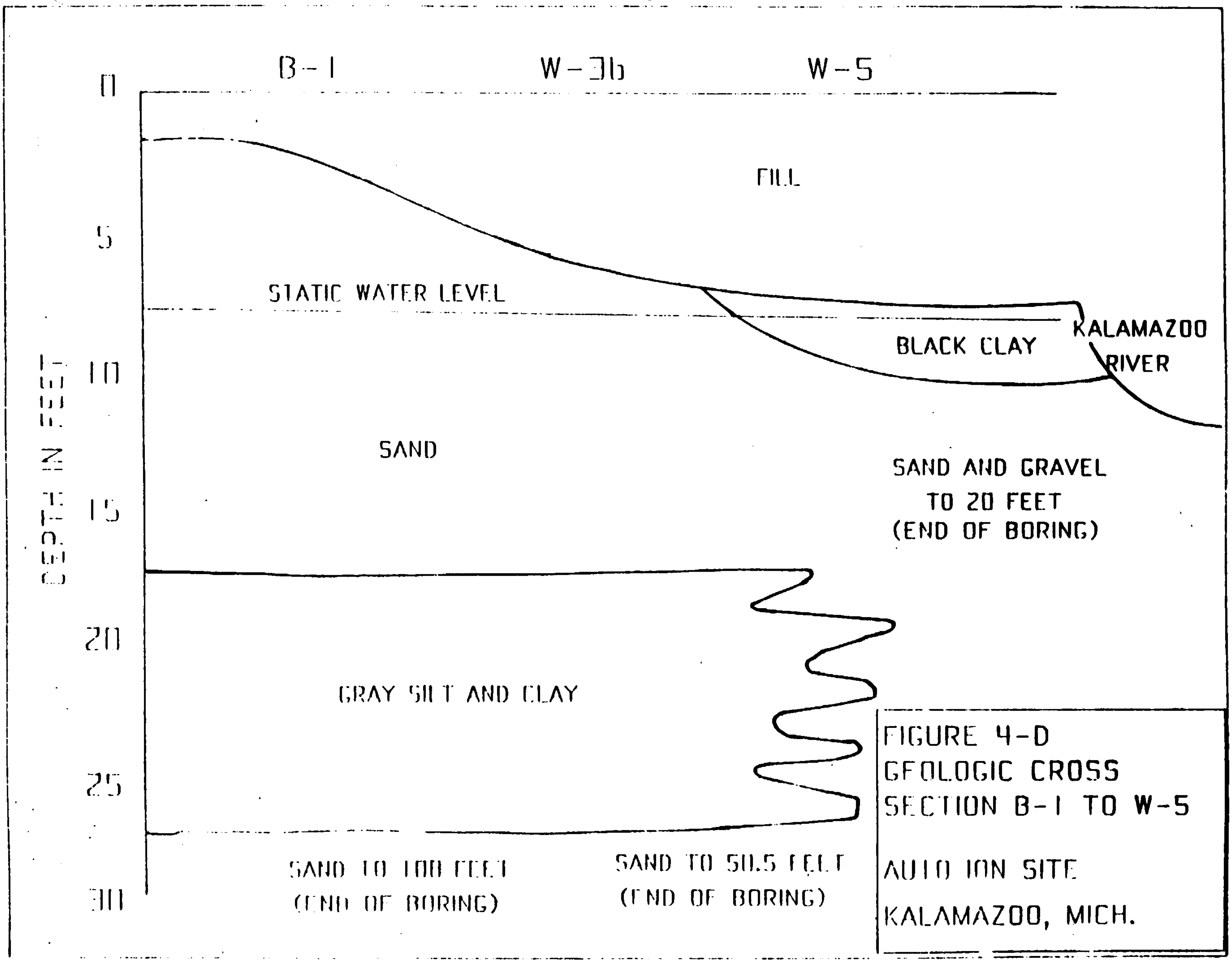


FIGURE 4-D
GEOLOGIC CROSS SECTION B-1 TO W-5

AUTO ION SITE
KALAMAZOO, MICH.

4.3 Surface Water Hydrology

The Auto Ion Site is located within the boundaries of the 100 year flood plain of the Kalamazoo River in the Kalamazoo River Drainage Basin. Surface drainage from the Site flows into either the city sewer system or the Kalamazoo River which subsequently drains into Lake Michigan at a point 40 miles northwest of the Site.

U.S.G.S. gauging station data from approximately three miles upstream of the Auto Ion Site (Comstock #09106000) indicates an average river discharge of 1000 cfs. Gauging station data (Table 4-1) indicates that a discharge increase of 400 cfs could result in a river stage increase of one foot at the Comstock gauge.

River depths within the study area range from 4 to 10 feet with a width of approximately 110 feet. The Site is situated adjacent to a meander in the river, and due to thalweg flow in this region river parameters that govern sediment transport cannot be determined with the available data.

4.4 Geohydrology

Well logs from the vicinity indicate that municipal and industrial groundwater wells, located within a two mile radius of the Site, utilize the sand and gravel aquifer. Based on limited well data the drift is at least 100 feet deep. Though sand and gravel deposits are generally under unconfined conditions, localized areas of clay layers may create confined conditions in areas of limited extent.

Groundwater levels for those wells located in the vicinity of Auto Ion were reported to range from 4 to 30 feet below the ground surface with an average depth at the Site being 10 feet. Water level data for the on Site monitoring wells, along with the corresponding staff gauge data shown in Table 3 indicate that recent precipitation events dictate the direction of flow in the aquifer that underlies the Auto Ion Site. The high k value, 3×10^{-2} cm/sec, indicated from the slug tests would allow for quick

TABLE 4-1

COMSTOCK GAGE DATA (09106000)

Date	Discharge (cfs)	Stage (ft)
10/21/87	736	1.34
12/02/87	1260	1.89
01/13/88	995	1.60
02/19/88	1170	1.76

response to precipitation events. The potentiometric surface indicates that during normal conditions the groundwater flows toward the river in a southwesterly direction (Figures 3-C,D,G). As previously mentioned, a storm event causing a 400 cfs discharge increase in the Kalamazoo River will result in a 1 foot stage increase. Such a storm event would cause a reversal in the groundwater flow to a northwesterly direction. This reversal can be seen in the potentiometric surface maps (Figures 3-E and F).

5.0 EXTENT OF CONTAMINATION

5.1 Subsurface Soils

Results of the analysis of soil samples at Auto Ion revealed that the west and southwest sides of the property contained highest concentration of contaminants, primarily within the upper 11 feet.

Boring W-1 (Figure 5-D) which represents background had two semivolatiles (di-n-butlyphtalate 840-1700 ug/kg, bis(2-ethylhexyl) phthalate 510-1400 ug/kg), and one volatile (2-butanone 58 ug/kg) present.

The borings W-2 and B-3 (Figures 5-D and 5-B) which represent the northeast and east side of the Site were analyzed for inorganics only. W-2 had only a small amount of cyanide (5.1 mg/kg) near the surface (0-2 feet) while B-3 had cyanide, cadmium, chromium, mercury and zinc concentrated in the first eight feet. Highest concentrations were contained in the 6 to 8 foot interval (chromium 2,968 mg/kg, cyanide 231 mg/kg, zinc 539 mg/kg). Mercury was detected in the 48-60 foot zone at 2 mg/kg and was detected in the 88-90 foot interval at 3.2 mg/kg.

The southeast corner of the Site, boring W-6 (Figure 5-F), was analyzed for inorganics and had only near surface contamination. Cyanide (74 mg/kg) was detected in the 0-2 foot interval and cadmium (1.2 - 1.5 mg/kg) in the 0-6 foot interval.

The center of the Site and boring B-2, which was located where the Auto Ion building had stood, was analyzed for organics and inorganics. Boring B-2 (Figure 5-A) had low concentrations of cyanide, semivolatiles, and a pesticide heptachlor (8.5 ug/kg). The greater number of contaminants were in the upper 11 feet. However, the semivolatile bis (2-ethylhexyl)phthalate 940 ug/kg) and the pesticide heptachlor were also detected in the 18.5-20 foot interval. Cyanide was detected throughout the boring.

FIGURE 5-A DEPTHS OF CONTAMINANTS AT AUTO ION

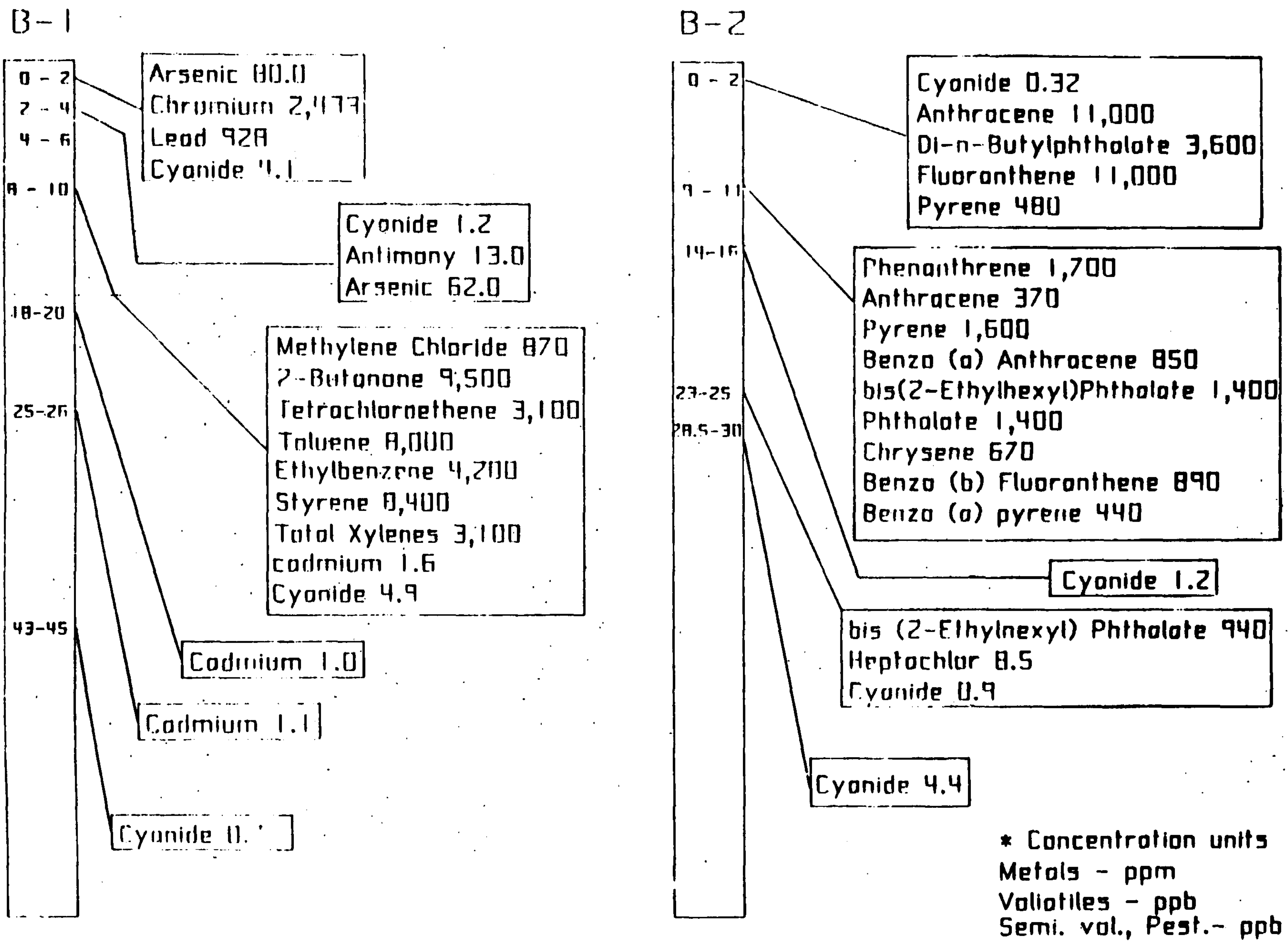


FIGURE 5-B DEPTHS OF CONTAMINANTS AT AUTO ION

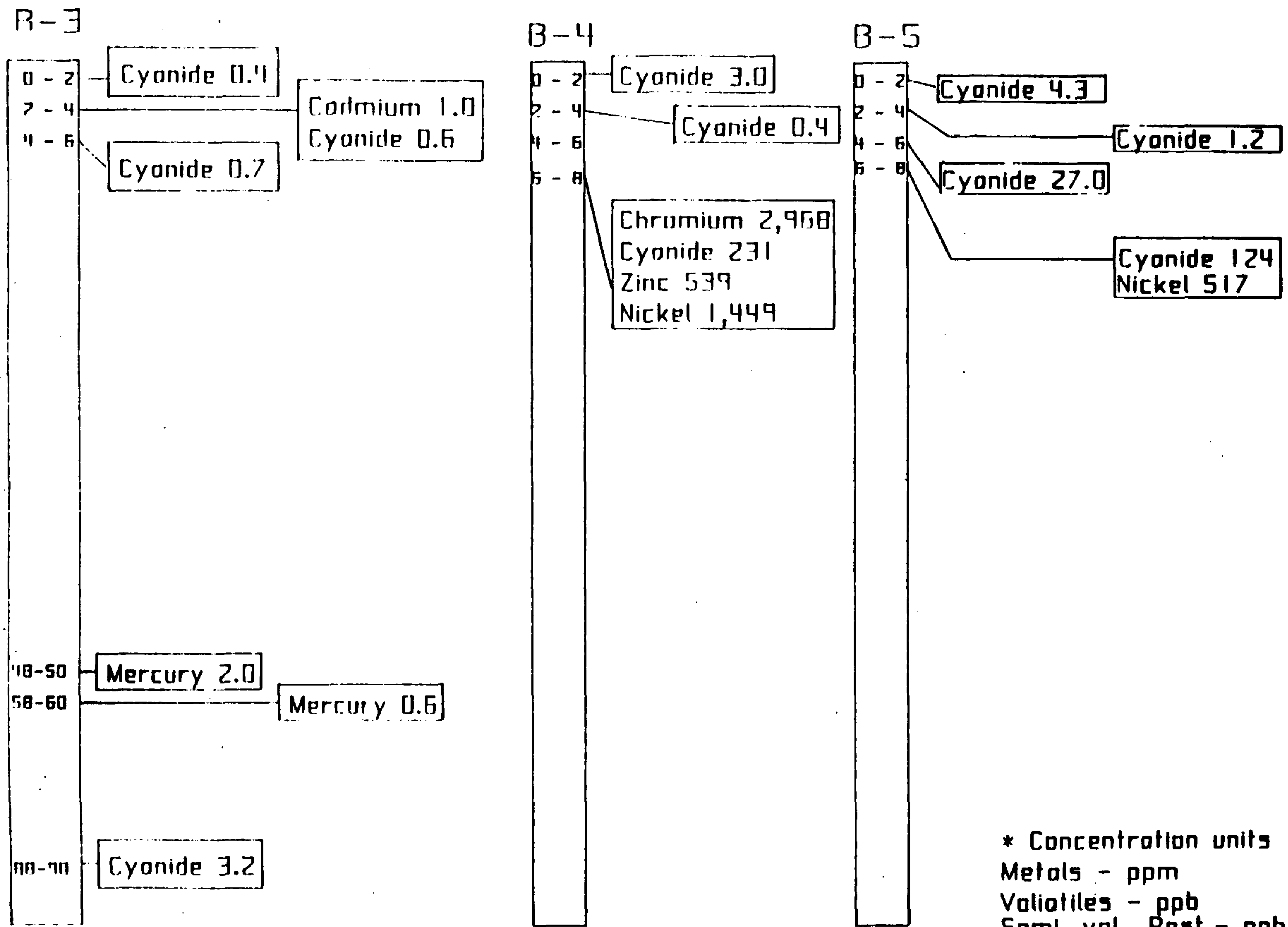
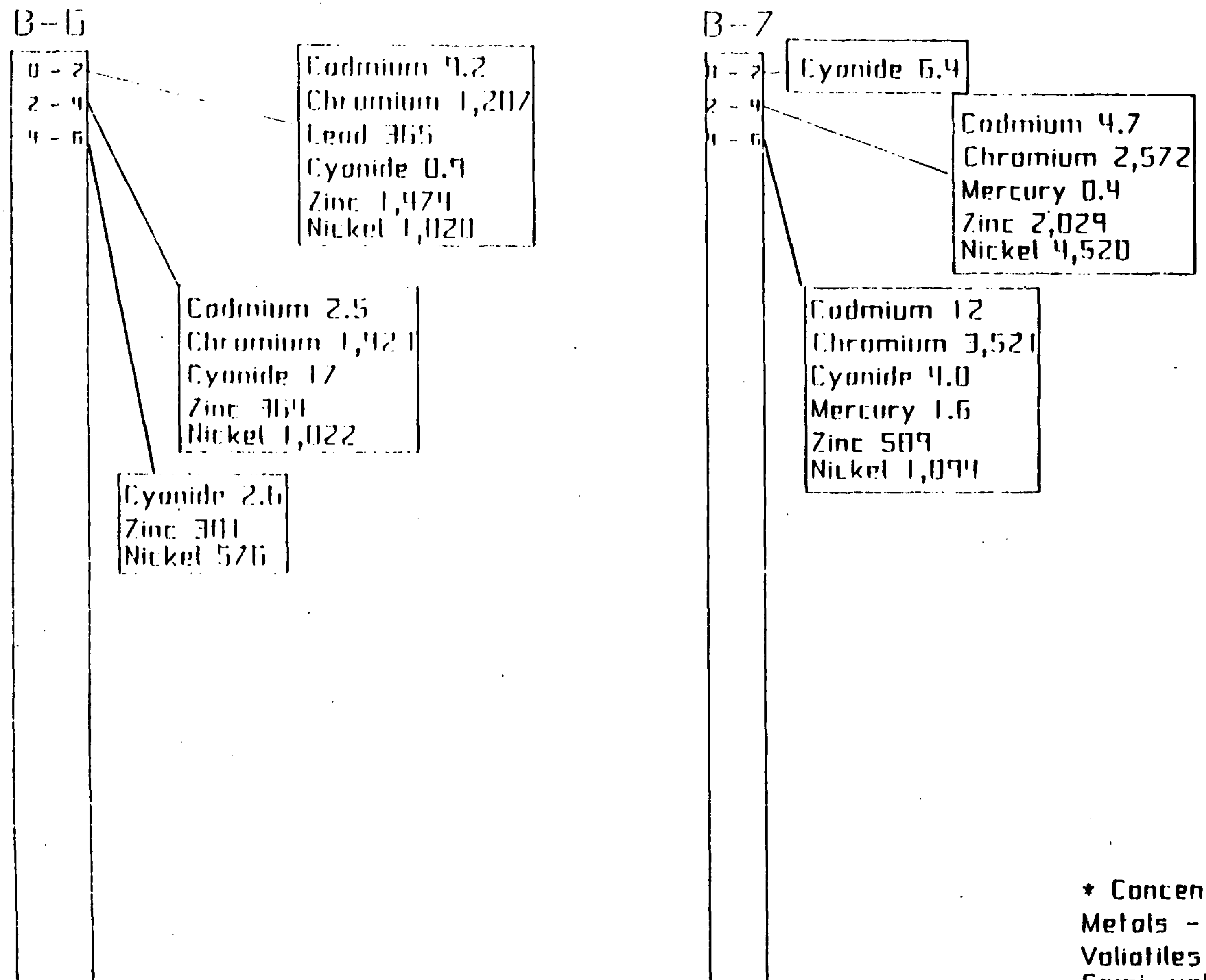
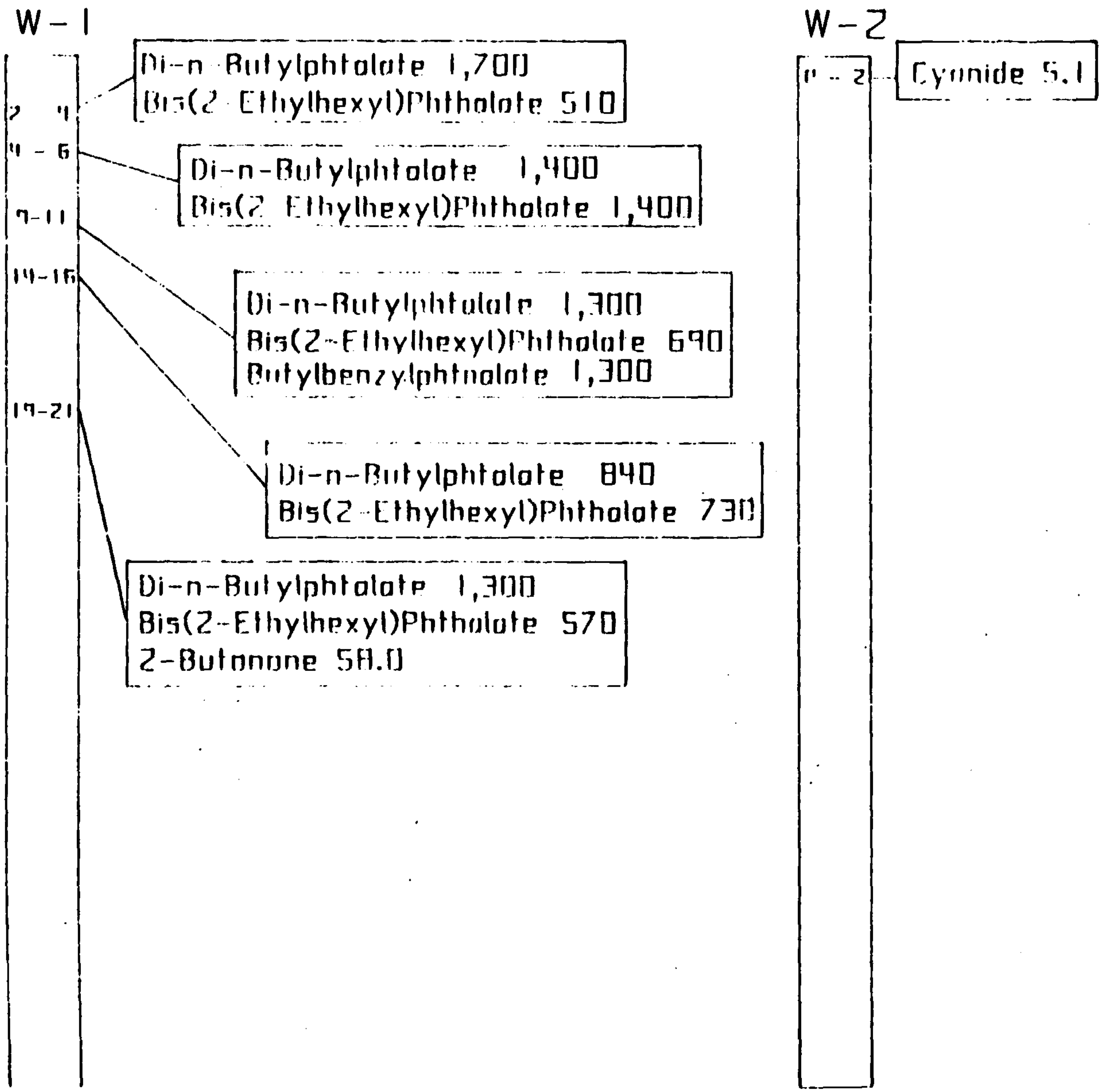


FIGURE 5-C DEPTHS OF CONTAMINANTS AT AUTO ION



* Concentrotion units
Metols - ppm
Voliotiles - ppb
Semi. vol., Pest.- ppb

FIGURE 5-D DEPTHS OF CONTAMINANTS AT AUTO ION



* Concentration units
Metals - ppm
Voliatiles - ppb
Semi. vol., Pest.- ppb

FIGURE 5-E DEPTHS OF CONTAMINANTS AT AUTO ION

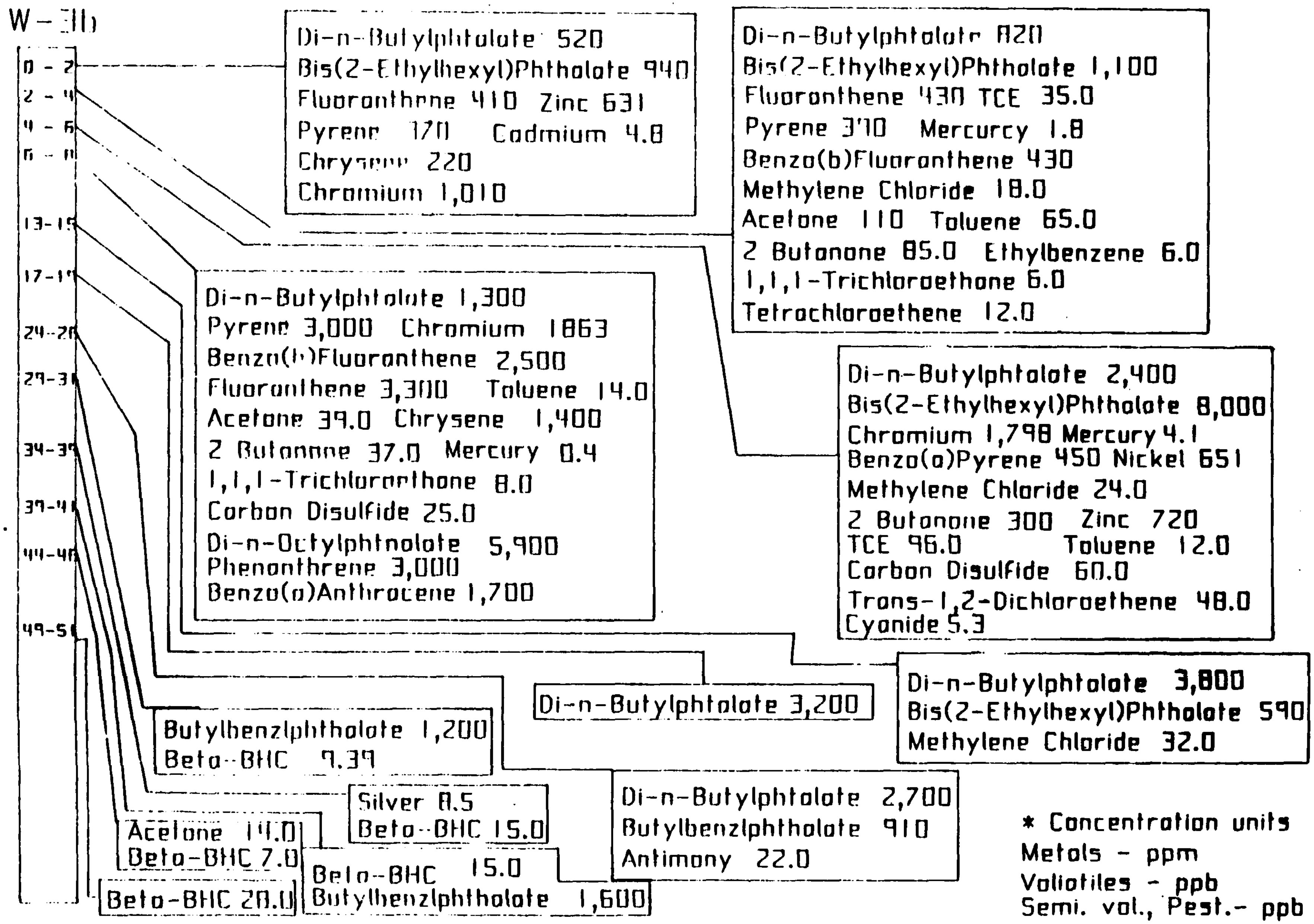
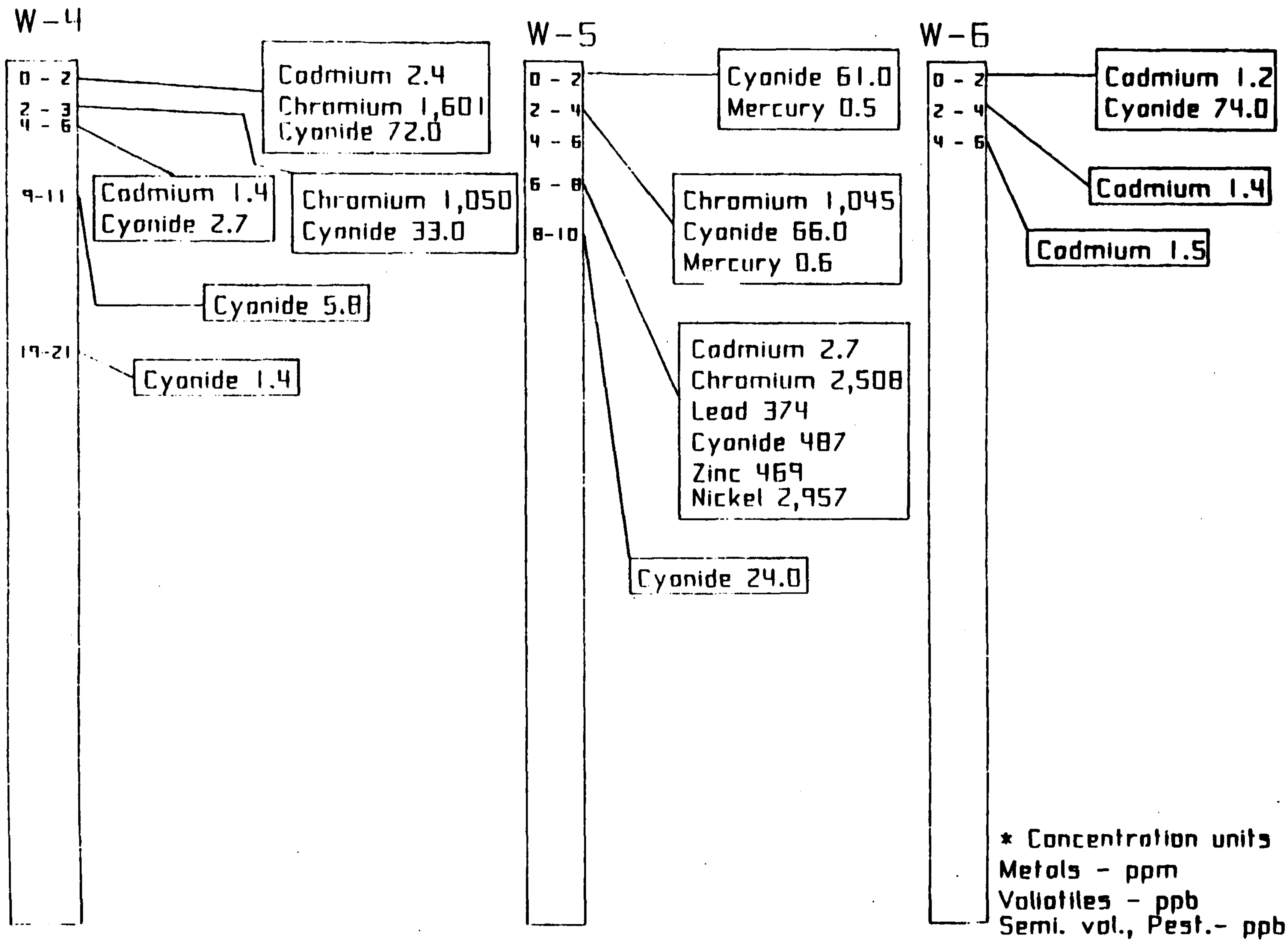


FIGURE 5-F DEPTHS OF CONTAMINANTS AT AUTO ION



The south central and southwest sides of the Site, represented by boring W-4 and W-5 (Figure 5-F) were analyzed for inorganics. W-4 in the south central part of the Site had cadmium (2.4 ug/kg) and chromium (1,050-1,601 ug/kg) in the first three feet of the boring. Cyanide was detected between 0 and 11 feet and again at the 19 - 21 foot interval. W-5 had mercury (0.5-0.6 mg/kg) in the first four feet, nickel (2,957 mg/kg) in the 6 - 8 foot interval and chromium (1,045-2,508 mg/kg) from 2 - 8 feet. The 6 - 8 foot interval had cadmium (2.7 mg/kg), lead (374 mg/kg) and zinc (469 mg/kg). Cyanide was present from 0 - 10 feet. Contamination in both of these borings was in the upper ten feet.

The lagoon and above ground storage tank were located in the west and northwest portion of the Site. Six borings (B-1, B-4, B-5, B-6, B-7, and W-3b) were located in this area. Two borings were drilled to 50 and 110 feet. Four were shallow borings to a depth of eight feet in the old lagoon Site. The two deep borings had the greater number and highest concentrations in the upper ten feet. Samples from W-3b (Figure 5-E), drilled to 50 feet, contained the most contaminants of all the borings on the Site. The upper ten feet had volatiles, semivolatiles and inorganics as shown in Figure 5-E. Below ten feet, volatiles were detected at 13.5-15.5 feet (methylene chloride 32 ug/kg) and 44-45.5 feet (acetone 14 ug/kg). The acetone detected at 44-45.5 feet is questionable as no other volatile was detected at that depth and it is a common laboratory contaminant.

The semivolatiles detected below ten feet were di-n-butylphthalate (2.7 -3,800 ug/kg) between 13.5-25.5 feet, bis(2-ethylhexyl)phthalate (590 ug/kg) between 13.5-15.5 feet and butylbenzylphthalate (910-1600 ug/kg) between 24-30.5 feet and at 39-40.5 feet. The pesticide beta-BHC (7.8-28 ug/kg) was detected between 29-50.5 feet.

Most contaminated samples from boring B-1 (Figure 5-A) were also detected in the upper ten feet. A sample at the four to six foot interval was collected for volatile analysis based on visual inspection. This sample detected several volatiles but the extent cannot be determined as it was the only volatile sample collected from this boring. The inorganics (arsenic 62-80 mg/kg, chromium 2,433 mg/kg, cyanide 4.1 mg/kg, lead 928 mg/kg and antimony 13 mg/kg) were detected in the first four feet. Cadmium (1-1.6 mg/kg) was detected from 10 to 26.5 feet and cyanide was detected at the 18.5-20 (4.9 mg/kg) foot interval and the 43.5-45 foot (0.7 mg/kg) interval. Three of the four shallow borings, in the area of the old lagoon (B-4, B-6, B-7) detected contaminants down to six feet (Figure 5-B and 5-C). Boring B-4 was contaminated in the first six feet with cyanide (0.4-2.7 mg/kg) and nickel (1,449 mg/kg). Boring B-6 was contaminated in the first six feet with cadmium (2.5-9.2 mg/kg), chromium (1,207-1,423 mg/kg) cyanide (0.9-17 mg/kg), lead (365 mg/kg), nickel (576-1,022 mg/kg) and zinc (354-1,474 mg/kg). Boring B-7 was contaminated in the first six feet with cadmium (4.7-12 mg/kg), chromium (2,572-3,521 mg/kg), cyanide (0.4-4 mg/kg), mercury (0.4-1.6 mg/kg) and zinc (589-2,029 mg/kg). Boring B-5, had nickel (517 mg/kg) at the six to eight foot interval and cyanide (0.4 - 2,968 mg/kg) in every sample.

5.2 <u>Groundwater</u>

The background well W-1 was sampled for purposes of comparison to those locations where contamination was suspected (Figure 3-B). This background location was sampled for inorganics, organics and pesticides/PCB's. The analytical results for this well revealed no pesticides/PCB's. Tetrachloroethene was the only volatile compound found at W-1. The conservative results from the first sampling round were used as a general comparison because of some analytical differences between sampling rounds.

Two semivolatiles, di-n-butylphthalate and bis(2-ethylhexyl) phthalate, were detected in W-1 as well as all other on-Site well samples. As these two compounds were found in the field blank at similar or higher concentrations, the validity of these results is questionable.

Well W-2, installed to monitor the northeast section of the Site indicated inorganic concentrations elevated over W-1 including arsenic, barium, beryllium, cadmium, chromium cobalt, copper, iron, lead, cyanide, mercury, nickel, silver, vanadium, zinc, and hexavalent chromium. The concentrations are listed in Tables 3-9 and 3-10. In contrast, the soil at this location contained only arsenic, barium, chromium, lead, cyanide and nickel. The volatile organics found in the well sample for W-2 were chloroform and trichloroethene (Table 3-8), while diethylphthalate was the only semivolatile detected at W-2. These compounds were not analyzed for in the soils from this area.

Well 3A monitors the upper aquifer in the area of the seepage lagoon. Well 3B monitors the deep aquifer in the same area. These wells, 3a and 3b, are separated by a clay lens with a thickness of about ten feet. The analyses for these wells had detected cyanide and nickel within the uppermost six feet of the soil.

Volatiles detected in the shallow well W-3a include vinyl chloride, methylene chloride, trans-1,2-dichloroethane and trichloroethene. No volatiles were detected in W-3b, which monitors the deeper aquifer. Both methylene chloride and trans-1,2-dichloroethane were found in the upper six feet of soil at this location.

One semivolatile, 2,4,6-trichlorophenol was detected in water samples from W-3a. This is the only occurrence of this compound at Auto Ion. Beta-BHC, a common pesticide known as lindane, had been detected in soil samples from W-3b below the clay lens. Beta-BHC, however, was not found in the groundwater nor would it be expected as it is not water soluble.

Wells W-4, W-5 and W-6 will be discussed together because of similarities in the analytical data and location with respect to the Kalamazoo River.

Nine inorganic compounds, arsenic, cadmium, chromium, cyanide, lead, manganese, nickel, vanadium and zinc were detected in all three of these wells at levels elevated over the background well W-1. Arsenic, cadmium, chromium, manganese, vanadium and zinc were detected in the soils at each well location. Copper and mercury were detected in the groundwater of wells W-5 and W-6, while barium, beryllium, and cobalt were detected only in W-6. These compounds had also been found in the soils for W-6. Volatile organics were detected in well W-4 and W-5, but none were detected in W-6. The volatile organics common in both W-4 and W-5 were; vinyl chloride, methylene chloride, and trichloroethene.

In addition, trans-1,2-dichloroethane, chloroform and 1,2-dichloroethane were also found in W-4.

One semivolatile, 1,2-dichlorobenzene, was present in the sample from W-4. Soils from W-4, W-5 and W-6 were not analyzed for organics.

5.3 Surface Water

With the exception of bis(2-ethylhexyl)phthalate which was also detected in the field blank, no volatiles or semivolatiles were detected in the surface water samples of the Kalamazoo River.

Inorganic analysis indicates detectable concentrations of lead, nickel, chromium, cadmium and aluminum in water samples taken along the D-transect (Table 3-17).

5.4 Sediments

Two volatiles (acetone and 2-butanone) were present in the sediment analyses. Three compounds were detected in 3 sample locations; two of these locations are off-Site.

The majority of samples collected contained three or less semivolatile organic compounds. Those containing eight or more semivolatiles were samples B1, B4, C2, D4 and E2, E3, E4, F1 and F2. Transects E and F contained the largest variety of organic compounds. Both E and F are located a considerable distance from the Auto Ion Site (approximately 1/2 and 1 mile respectively). These transects also showed higher concentrations of arsenic, cadmium, lead and nickel than most of the other sampling stations.

Samples collected from two of the transects, D and F, showed positive results for PCB analyses. Both of these transects lie downstream of the Auto Ion Site. No PCB's were detected in samples collected directly adjacent to Site. A review of STORET (a water quality database containing the analytical results for various parameters conducted at different locations on many

Michigan rivers) water quality information reveals the detection of PCB's in Kalamazoo River sediments both upstream and downstream of the Auto Ion Site.

Stations D4 and B3 also contained higher concentrations of metals such as arsenic, nickel and lead. The highest concentration of lead occurred at B3 located just downstream of the storm water runoff drain. Although magnesium values were high in a majority of the analyses, concentrations appeared to be similar in most samples including those in background sampling locations and are possibly due to naturally higher concentrations of magnesium within the Kalamazoo area.

Sample D1 had a very high concentration of mercury (2.9 mg/kg). D1 lies ten feet downstream of the circulating outfall on the opposite side of the river from Auto Ion, and approximately 170 feet downstream from the surface water discharge pipe. Cyanide was not detected in those samples that had usable analyses. Nickel was present in low concentrations in background samples, Site samples, and downstream samples, with most of the detectable nickel occurring in the E and F transects. Higher values of zinc were also detected along the E and F transects.

Sampling station D4 appears to have higher metal concentrations and more detectable metals present than most samples within the Site. This station indicated a variety of organic compounds present as well. Two stations on B and C also detected a number of organic compounds in the analyses.

The biggest variety and often the higher concentration of both organic and inorganic compounds occurred along the E and F transects. It is likely because of the distance between the Auto Ion Site and these transects, that pollutants are entering the Kalamazoo River from other sources upstream from E and F sampling stations. Many industries discharge into Portage Creek which enters the Kalamazoo River upstream from both E and F transects, but downstream from the Auto Ion Site.

5.5 Summary

In review of the different matrices analyzed at the Auto Ion Site, several generalizations can be made:

- Semivolatiles detected in both soils (where analyzed for) and river water sediments, did not occur in groundwater.
- No PCBs were detected on the Auto Ion Site.
- No pesticides or PCBs were detected in groundwater samples.
- Inorganics not detected during the first round of groundwater sampling at the background well (W-1), and ubiquitous at the Auto Ion Site include arsenic, cadmium, chromium, copper, cyanide, iron, mercury, nickel, vanadium and zinc.
- Analyses of well W-3b, penetrating the deep aquifer, indicates comparatively lower levels of inorganic constituents and an absence of organic compounds.

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